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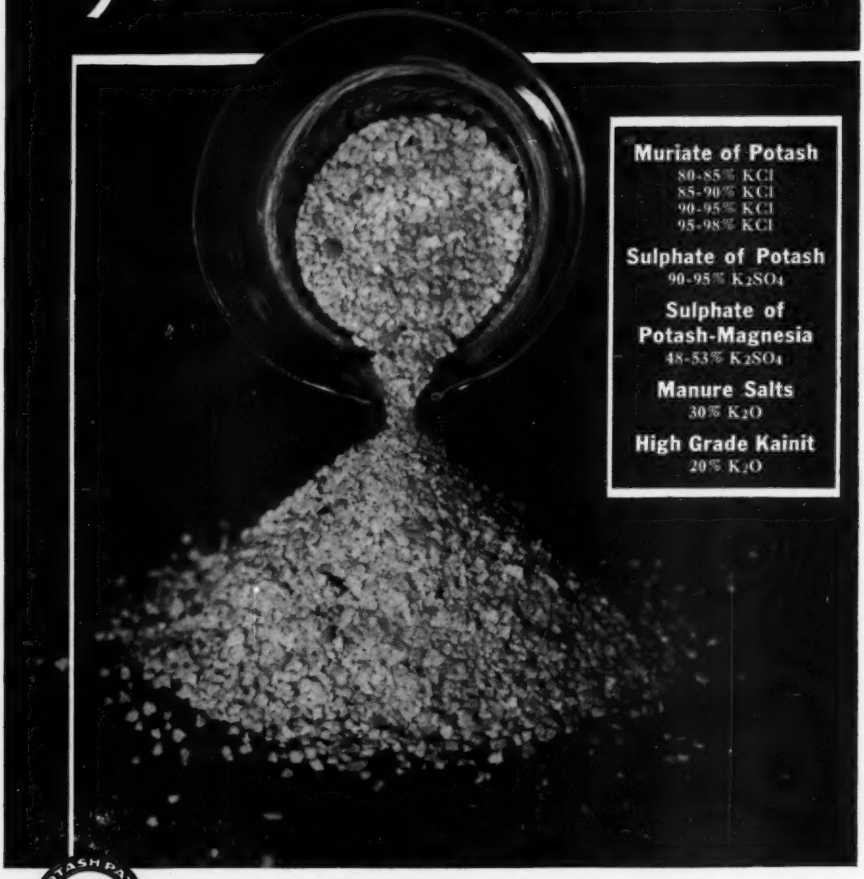

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Better Crops with PLANT FOOD

The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Editor*
Editorial Offices: Investment Bldg., Washington, D. C.

VOLUME XX NUMBER EIGHT

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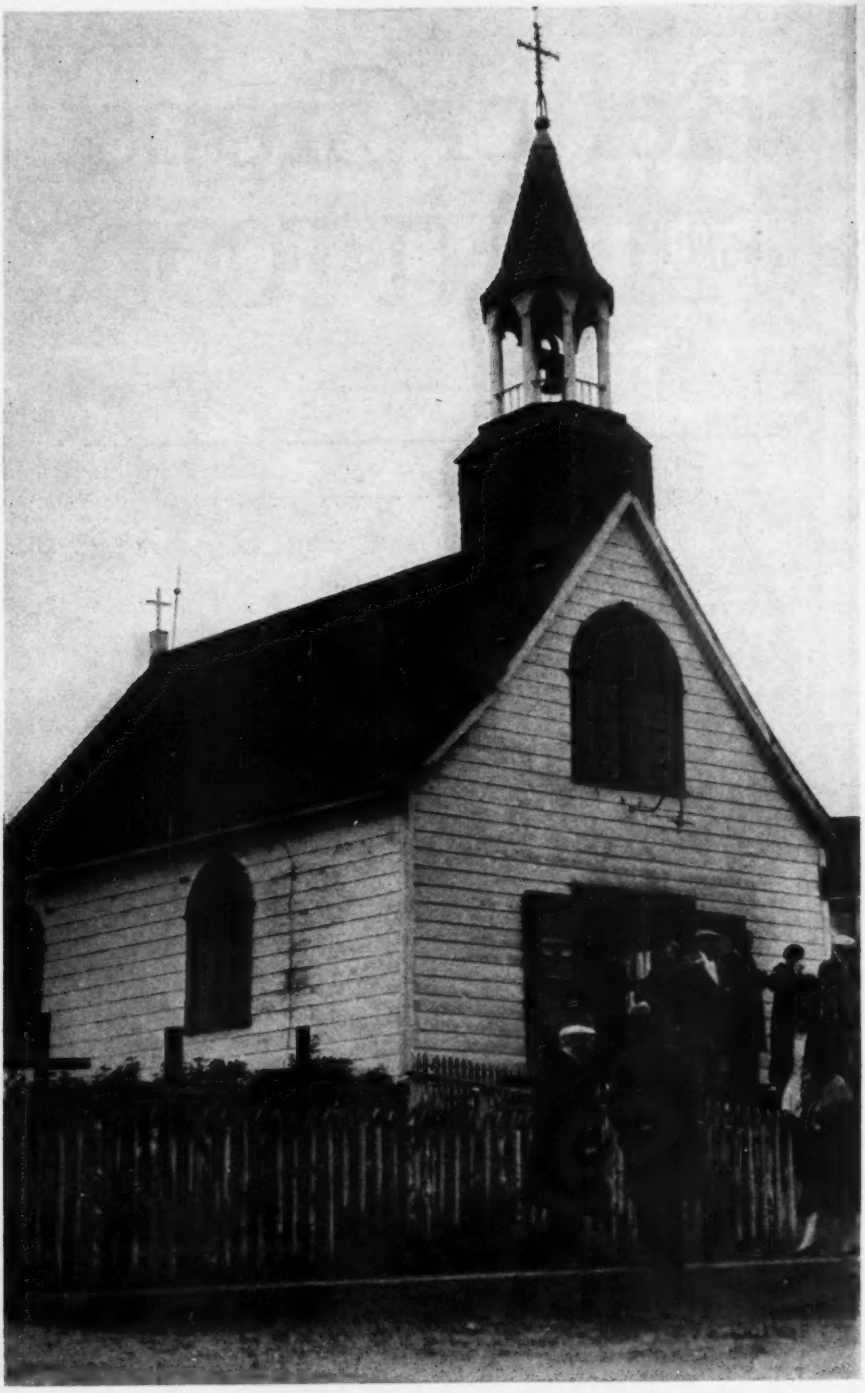

Services are still held at the oldest church in North America—Tadoussac, Quebec.

Better Crops with PLANT FOOD

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VOL. XX WASHINGTON, D. C., APRIL, 1936 No. 8

Showers, gullies, ditches, and mud—

Soaked Again

Jeff McDermid

APRIL puts one in a moist and spongy mood. It is then that we usually get the greatest abundance of one of the best public utilities which the world gets for nothing—rain water. While too much water in any one place at any one time is objectionable, there are plenty of folks who seem to thrive without it in any form, and who refuse to get into it or let it get into them.

Water reflects things, of course, and one of the things it reflects is the inconsistency of human impulses and the opposite extremes of life. My young son is perhaps as good a case as any, when he comes home with his neck neglectfully sooty and his feet efficiently soaked. Next summer he will show up every day with moist hair and clammy wrinkled hands, whereas no amount of colored porcelain, foamy tinted soap, and parental urging have overcome his sense of injustice toward the "plotters' Saturday night."

Until the summer dry wave of 1934, a favorite quotation of the meek and lowly was that "water from heaven falls alike on the just and the unjust." Since that memorable season we are apt instead to discount the effect of penitence and prayer in behalf of moisture, regardless of the certified credentials of the suppliant or his importunate endurance.

Absence of normal waterfall on our

continent in 1934 did more than curl my shingles, parch your parsley, and reduce the flowage of Niagara Falls. It turned benefit payments into crop insurance. It shook the foundations under planful economists and loosened the bolts in their comptometers. It shocked the "regimentors" and boosted the stock of soil science. It turned the distorted laments of consumers over fancied food scarcity through contracts into equally extravagant predictions of a universal desert and cacti in the corn-belt. It put the flustered weather bureau at the apex of the leased wire service. It forced Congress to admit that here was an emergency, my friends, which could not be alleviated by short debate and sudden voting.

PERHAPS it was that whimsical and disconcerting philosopher Xenophon Caverno of Missouri, whose remark at the Chicago soil conservation conference got me all stirred up, merely on water.

I cannot vouch for the idea's origin, there being so many of us engaged in tooting our horns in that hour of auspicious overture. At any rate, this solemn voice with the timber of the tundras and accents of alkali reminded the earnest foes of soil depletion and consumer deflation that crops wouldn't grow well where it is a case of considerable mileage to moisture, up, down, or sideways.

He did not exactly pronounce any doxology on the whole revival meeting, but he did inject the hunch that two crops of cowpeas after seven crops of cotton do not make a successful summer, unless you have a water table handy for the plant food to be spread out upon.

He probably didn't quite figure out how we can reduce plant water loss and conserve soil moisture capacity by shifting to hay crops, unless we do a generous amount of plowing them under. Although there isn't a single guarantee clause for a water supply in the new law, it can be locally administered so as to make it easier for plants to get what there is of it. Yet we must remember 1934. They can't turn on any spigots at Washington.

UP here in my state we get about a yard of rain-water during *almost* every year. Not a few of the sages up here decry the terrific waste of energy and enthusiasm, not to mention cash and cuss words, of trying to make chlorophyl and vitamins by arid agriculture. They forget that neither the Federal Government nor the states have any right to obstruct, interfere, interrupt, or otherwise deter or prohibit the sacred liberty of every American to call himself a farmer and to sow whether he reaps or not. Being thus unable to divert the playful propensities of such people from attempts at crop production, it becomes the duty of the republic to build dams so that water may sometimes be available and lend them money at fractional interest and no net security, so they can buy drought-resistant seeds and pay their water-rent. I predict that there will be worse and more of it when the high and dry states obtain fuller control of their soil-conserving funds. Local option, wet or dry, is sure to bring action.

But we can best approach this topic by what might be termed a sentimental seminar. A little review is not taboo.

THE supply of water in the soil itself and in the atmosphere in the form of humidity are the chief limiting factors in plant culture. Specialists tell me that there is usually plenty of sunlight, oxygen, and carbon dioxide, and that countless tons of the best mineral fertilizer are within command. Temperatures of air and soil water and the rate of wind velocity, of course, play a major role in the absorption and respiration rate of water

in plant cells. The intake and outflow of moisture from root hairs to leaf stomata, both in degree and in volume, determine the adaptability of plants to environment all over the world.

Now men are inclined to insist on living where they choose, where land is cheap, or where elbow room is plentiful. Being thus located, they demand results when they stick something into the dirt. They prefer to pray for rain or sweat themselves into

a lather to save what few drops there are rather than to pay off the railroads' mortgages and salary sinecures for hauling them grapefruit, apples, cabbage, melons, and oranges, which are 90 per cent aqua pura.

DRY-LAND irrigators are as prone to follow certain ways of soil baptism as the other sinners who belong to various denominations. We have, therefore, those who believe in flooding, others who are saved by furrow pouring, and yet a third group whose faith lies in sprinkling. I may digress here to reveal that my own sturdy northern empire of rural integrity and agricultural acumen has irrigators in its midst!

One sect floods and the other sprinkles. Another group tried subirrigation, but they inadvertently struck an Artesian well strata, and now live by renting boats and selling bait. The flooding brethren operate sanded cranberry marshes and keep old Jack Frost guessing by the hydraulic method, unless they happen to oversleep some critical morning. They enjoy a benevolent sort of monopoly and actually have their business headquarters rather close to Wall Street—which information to the prejudiced may be like letting cats loose.

OUR sprinkler clan afford an interesting case. They grew bowlegged staggering around trying to add to the blotting qualities of their building-sand estates through a process of rapid feeding and drenching of livestock, and the subsequent incorporation of the alimentary residues to their granular ground. They even tried geese knee-deep in June grass and the lonely but talented bittern, to no avail. Their patient process of adding elemental excreta to make those thin soils spongy, so that symbiotic and anaerobic bacteria might hit their stride, in order that *Medicago sativa* would shove *Agropyron repens* off the premises and thus provide cheap protein for more animal metabolism, was—to come up for breath—a practical fizzle. It was not even as profitable as riding a whirligig with brass rings.

Finally, after thirty years of a misspent life, one man with vim and vision installed about 25 miles of overhead pipes and squirters, pumping his water from a reedy lake into storage tanks, and raising such truck as you never saw outside of nursery catalogs. His neighbors joined in to some extent, and today this community sells its lake water at fancy prices, wrapped up in nature's packages. They have quit hauling manure and use concentrated fertilizers to grow fruit and maintain their rotation meadows for plowing under.

Having disposed temporarily of the chaps who stay in places which require more water than the clouds pro-

(*Turn to page* 44)

Side-dress Corn With Potash

By Herbert L. Garrard

Lafayette, Indiana

PROFITABLE yields of improved quality corn have been obtained by side-dressing corn plants after the symptoms of potash hunger appeared in fields in northern Iowa and southern Illinois. The question as to whether remedies can be applied during the same growing season, when injuries due to potash starvation of young plants occur, seems to be answered in these experiments. Although in several cases the side-dressings of muriate of potash were made much later than would be done in ordinary practice, the starved plants recovered and yielded well in comparison with the untreated.

These results are, therefore, of interest, because increased attention is being given to the study of plant-food deficiency symptoms for many agricultural crops. Usually these deficiency symptoms are used to diagnose troubles and to suggest treatments for the next crop. In this report it will be shown that, if the symptoms of potash deficiency are recognized sufficiently early in the season, potash can be applied profitably to the crop on soils similar to those on which these tests were made.

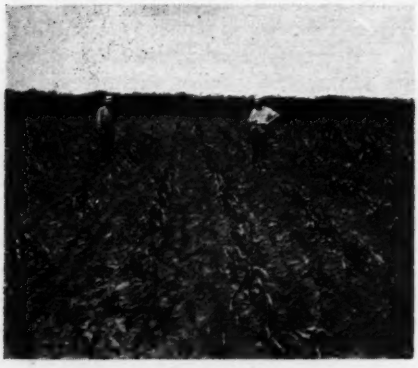

Fig. 1—W. G. Meyer field, Webster City, Iowa, at the time of side-dressing with muriate of potash, July 15, 1935.

If the supply of available potash in a soil is very low, corn plants will become damaged very early in their growth and development, whereas, if the supply is relatively greater, the plants apparently may grow normally at first but will show signs of a failing supply of potash at any time up to the formation of the ears. Even during the maturation of the ears, the supply may become depleted and immature ears which display definite characteristics of potash starvation will result. Consequently, the symptoms may be seen in young plants or may not become strikingly evident until harvest time.

When young corn plants are growing without sufficient potash, the lowermost leaves become yellow, which is followed by a dying of the tips and edges of the leaves. This type of injury is commonly referred to as "marginal firing, or scorch." Often the starved plants die in this early stage. They may fail to grow into anything more than severely stunted and barren plants. The fields for the potash side-dressing experiments were selected when these early symptoms were found, as shown in Figs. 1, 4, and 6.

Fig. 2—W. G. Meyer field, August 31, 1935. Left: All plants stunted and showing brown marginal leaves. Right: Response to 200 lbs. muriate of potash applied as a side-dressing. All plants have normal green leaves.

If the supply of available potash proves inadequate for the increasing demands of larger plants later in the season, the older leaves will show injuries similar to those described above. The lower leaves develop the brown, marginal firing, and this injury may progress upwards and include most of the leaves on the plants. If the plants are still able to produce ears, they are usually chaffy and of low feeding quality, due to the failure of the kernels to fill out with starch. Such ears are short and tapering, with the tip kernels shrivelled. The plants frequently die prematurely. They become weak and may lodge or lean badly. The shanks bearing the ears become brittle and break easily, even under the weight of the immature ears or nubbins.

In order to determine whether or not potash would be beneficial when applied during the same season to corn plants showing signs of potash hunger, 15 experiments were inaugurated in Iowa, and 3 in Illinois. Fields were selected in each case where the young corn plants showed unmistakable signs of injury due to potash starvation. Figs. 1 and 4 show two of these fields at the time the potash was applied as side-dressing.

The problem of how to apply potash most effectively in the high-lime soils in Iowa is not definitely determined. It depends on whether the field is relatively uniformly "alkaline" throughout, or whether the high-lime areas occur scattered irregularly in the field. In most fields where the high-lime areas exist, the whole field will be benefited by the potash in the fertilizer used at planting time; but where the higher-lime areas exist, more potash is needed. This extra amount may determine the profits obtained from the crops in such fields.

These experiments were planned, not to find a supplementary method of applying fertilizers, but merely to discover whether potash could be sup-

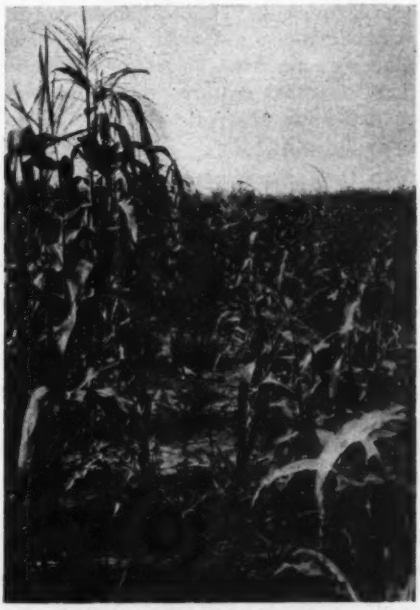

Fig. 3—W. G. Meyer field. Response to 500 lbs. muriate of potash per acre 47 days after side-dressing. Very little effect on adjacent row.

Fig. 4—Henry Cahill field, Mason City, Iowa, at time potash side-dressings were made, July 16, 1935.

Fig. 5—Corn from 100 hills, October 20, 1935. Marketable corn in sacks; poor quality on ground. (See Table I.)

plied profitably to corn starving for this plant-food. Accordingly, the experimental side-dressings were made with a small hand drill on both sides of each row, following the marks of the inside shovels of the cultivator. The potash was located at a depth of 2½ to 3 inches. This approximates the placement which would be obtained by using the regular fertilizer attachment on a corn cultivator. The potash must be applied close to the plants in moist soil, if it is to become effective quickly. Surface applications of potash require time to become available for absorption by the plant roots.

In these experiments the side-dressings were made three to four weeks later than would be recommended practically. Much of the corn was knee high when side-dressed, and all of it showed medium to severe symptoms of potash hunger.

Within a month to six weeks the effects of the extra potash were very striking. The four rows which were side-dressed with muriate of potash grew rapidly and became tall and green between the rows of stunted corn, in which all of the lowermost leaves were badly "fired" and many of the upper, younger leaves showed the characteristic brown marginal "scorch."

One of the questions which arose during the progress of this work was "how close to the row and how much potash per acre could be used to side-dress the corn before injury to the plants might occur?" In these high-lime soils this question was practically answered on the farm of W. G. Meyer, near Webster City, Iowa. One row of corn was selected, and muriate of potash was applied as close to both sides of the row as it was possible to cultivate, at the rate of 500 lbs. per acre. Fig. 3 shows the very beneficial effect 47 days after the side-dressing was applied. You will note (in Fig. 3) that the row to the right of the treated row was not benefited. The side-dressings help mostly the treated rows of corn.

(*Turn to page* 40)

Fig. 6.—Henry Bruhn field, Cylinder, Iowa, at time of applying side-dressings of muriate of potash.

Negro farmers are interested in the fertilizer experiments at the Georgia Experiment Station.

Fertilizing Georgia's Cotton Crop

By R. P. Bledsoe

Agronomist, Georgia Experiment Station, Experiment, Georgia

FOR the past eight years the Georgia Experiment Station and the Division of Soil Fertility, U. S. Department of Agriculture, have conducted experiments in six locations in the state with different kinds and amounts of fertilizers. Forty-three different fertilizer treatments were used in the experiments. It will not be possible in this article to give more than a brief summary of the results obtained.

As would be expected, the application of increasing amounts of fertilizer resulted in increased yields of cotton. Taken by themselves, yields per acre had little practical significance, as the increased cost of the fertilizer often exceeded the value of the increased yield of cotton. Interpretation of results was, therefore, based on the profit obtained from the fertilizer and the profit per dollar invested. Costs based on present-day prices were as follows: nitrogen, 10.31 cents per pound; phosphoric acid, 6.62 cents per pound; potash, 3.43 cents per pound; seed cotton, 4½ cents per pound. The cost of hauling, handling, and applying the fertilizer was not included in the cost figures.

The average Georgia farmer applies about 261 pounds of a 4-8-4 (N-P-K) fertilizer (including top-dressing) per acre, which cost approximately $2.81, and obtains a yield of about 525 pounds of seed cotton. There is no direct way of telling how much profit

TABLE 1.—RATES OF APPLYING FERTILIZERS.

Fertilizer per acre	Pounds seed cotton per acre	Increase per unit of fertilizer	Profit per acre from fertilizer	Profit per dollar invested	Cost of fertilizer
No fertilizer	458	...	....	...	....
400 pounds 4-8-4*...	733	275	$8.59	$1.87	$4.32
800 pounds 4-8-4....	1,006	273	16.02	1.85	8.64
1,200 pounds 4-8-4....	1,111	105	16.43	1.27	12.96
1,600 pounds 4-8-4....	1,161	50	14.36	0.83	17.28
400 pounds 8-8-8....	1,002	...	17.96	2.75	6.52

* N-P-K.

he obtains from this fertilizer. However, by using the figures in Table 1 it is possible to estimate that 261 pounds of fertilizer increase the yield 178 pounds of seed cotton and net him a profit of about $5.15 per acre. Of course, there is no such farmer as the "average farmer." This is merely a composite picture to show the general fertilizer condition in the state. Some Georgia farmers are using much more fertilizer than this, many are using less, some none at all, and a few too much.

Compare the figures given in the above paragraph with those given in Table 1. Four hundred pounds of a 4-8-4 gave a profit of $8.59, and 800 pounds gave a profit of $16.02 and a return per dollar invested equally as good as the 400-pound rate. With the above 800 pounds the profit per acre was good, but the profit per dollar invested decreased sharply.

A 4-8-4 fertilizer (without top-dressing) is not the most economical fertilizer to use under cotton, but when used at the rate of 800 pounds per acre is fairly satisfactory, except for its high cost. When used at any other rate it is not satisfactory. It is evident, therefore, that the rate per acre and the analysis must be considered together in evaluating fertilizers. In other words, we must consider pounds of plant food per acre which combine both rate per acre and the analysis. The number of pounds of plant food in 800 pounds of a 4-8-4 can be obtained by multiplying pounds of fertilizer per acre by the analysis of the fertilizer and pointing

These plots have been well supplied with nitrogen, but are lacking in potash and phosphate. Note the poor stand of cotton.

off two decimal places. Thus 800 pounds of a 4-8-4 contains 32 pounds of nitrogen, 64 pounds of phosphoric acid, and 32 pounds of potash.

In Table 2 is given a brief summary of the results obtained in the experiment. The table shows that the greatest increases were obtained from nitrogen. Where only 16 pounds of nitrogen were applied per acre, the profit per acre was only $8.89 as compared with $15.67, where 32 pounds of nitrogen were used. Where 48 pounds of nitrogen per acre were used, a small increase in profit ($1.54) was made. However, this increase was obtained only where the phosphates were also increased to more than 32 pounds per acre, which greatly lowered the profit per dollar invested.

The application of sufficient nitrogen is the key to the proper fertilization of cotton. When applied at the rate of 16 pounds per acre, there was no combination of phosphate or potash which would give a profit per acre as compared with those obtained from 32 pounds of nitrogen. Judging by the results obtained from 48 pounds of nitrogen per acre, 32 pounds appear to be about the minimum for best results, and a slightly heavier rate between 32 and 48 may be the best.

Nitrogen applied after chopping will often cause the cotton to grow too big and to fruit late. This can be avoided by applying all top-dressing nitrogen on or before chopping time.

The best rate of applying phosphoric acid was 32 pounds per acre. Applying more phosphate than this did not increase the profit per acre and greatly decreased the profit per dollar invested and the cost of the fertilizer.

It should be remembered in considering the results obtained from potash, that 16 pounds of this element now cost only about 55 cents. And there are many soils both in the Piedmont and the Coastal Plain which will not respond properly to other fertilizers, unless a liberal application of potash is used. In the soils used in this experiment the first 16 pounds of potash gave a profit of 300 per cent, the next 16 pounds gave a profit of 50 per cent, and the next two 16 pounds paid for itself. It seems, therefore, safe to recommend 32 pounds of potash for average conditions.

Results obtained in Table 2 indicate that an application of 32 pounds of nitrogen, 32 pounds of phosphoric acid, and 32 pounds of potash is the most profitable fertilizer combination

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TABLE 2.—RATES OF APPLYING NITROGEN, PHOSPHATES, AND POTASH. AVERAGE OF 918 EXPERIMENTAL TRIALS.

Rate of fertilizer in pounds per acre	Pounds seed cotton per acre	Increase per unit of fertilizer	Profit from fertilizer	Profit per dollar invested
No fertilizer	458	...	...	...
Av. all plots receiving 16 lbs. nitrogen*	811	178	$8.89	$1.27
" " " " 32 " "	998	+187	15.67	1.81
" " " " 48 " "	1,069	+ 71	17.21	1.67
" " " " 32 " phosphoric acid	922	43	14.38	2.21
" " " " 64 " " "	963	+ 41	14.11	1.63
" " " " 96 " " "	992	+ 29	13.28	1.23
" " " " 16 " potash	943	50	13.75	1.70
" " " " 32 " "	961	+ 18	14.00	1.62
" " " " 48 " "	974	+ 13	14.02	1.53

* Equivalent to 19.5, 39, and 58 pounds ammonia.

The Inquiring Mind *and the* Seeing Eye

By Alister B. Alexander

Madison, Wisconsin

"LAST year I visited the birthplace of my parents in the mountainous section of Switzerland, and now I realize why my father thought Iowa was too flat." As we sat in his office in the Soils Building at the University of Wisconsin, Emil Truog told me of his early life and of his work in soil science.

"I was born on a farm at Independence, in Trempealeau county, Wisconsin, on March 6, 1884. My father, Thomas Truog, was born in Switzerland and, after coming to the United States, worked as a carpenter up and down the Mississippi River. In the 1850's long before there was a railroad in many parts of Iowa, he and a companion walked across that state from east to west, looking for suitable land on which to settle. But the Iowa prairies seemed too level after the native Switzerland, and they came to Wisconsin where my father finally bought a farm in a rolling section of Trempealeau county. He married Magdalena Keller, who also was born in Switzerland, had come to this country at the age of 11, and who still lives on the old home farm with one of her sons." Thus we introduce to you Emil Truog, the son of this pioneer Swiss couple in northern Wisconsin.

Emil Truog, while attending the district schools of Trempealeau county, worked on the farm between times and liked it. After finishing the grades he went first to the Independence High School, which at that time offered only a junior high school course, and then to the one at Arcadia, where he finished his high school work. During all of this time the boy helped with the farm work and dreamed of the time when he might be able to attend the College of Agriculture, which he read about constantly in the farm papers. He learned the different problems that arise on a general farm but always was more interested in plants than in animals and developed a great desire to study soil science, a desire in which he was encouraged by his teachers. With that thought in mind he enrolled in the Wisconsin College of Agriculture at Madison and received the degree of Bachelor of Science in Agriculture in 1909. From 1909 to 1912 the young student acted as an assistant in the Soils Department, carried on graduate studies, and was granted his Master's Degree in 1912, from which time until 1916 he was an instructor. In 1917 he became an Associate Professor, and in 1921 Professor of Soils, the position he now holds.

Famous for Soil Test

In 1925 Professor Truog was married to Lucy Price Rayne, the daughter of a pioneer lumber family of Madison. In the living-room of their home, which is a large Colonial house built by the Rayne family, are pic-

tures of their three attractive children, Nancy Price, who is eight, and the twins, John Rayne and Martha Rayne, who are six years old.

One of the earliest outstanding soil projects with which Emil Truog's name is associated is his soil acidity tester, first developed in 1911. In this device, known as the Truog Test,

EMIL TRUOG

he devised a portable soil acidity tester which could be used for making tests on the farm. The apparatus is composed of: (1) A brass alcohol heater, consisting of an alcohol lamp with a three-ply wick and a circular wind guard, which also acts as a support to hold the flask at the proper height from the flame. The lamp has a perforated disk radiator which protects it and the alcohol from undue heating. (2) A 300-cc. pyrex glass Erlenmeyer boiling flask with a 100-cc. capacity mark. The inside diameter of the neck is one inch. (3) A soil measuring cup or scoop having a capacity of 9 cc. (4) A brass spoon having a capacity of 0.8 cc., for measuring chemicals. (5) An iron spatula for mixing and measuring soil samples and chemicals. (6) A container for distilled water. (7) A set of chemicals consisting of a bottle containing an intimately ground mixture of 10 parts of neutral barium chloride to 1 part of neutral zinc sulfide, and a vial containing strips of lead acetate test paper. (8) A towel. (9) A box of matches. (10) A standard acidity and lime chart for determining degree of acidity and amount of lime needed under different conditions. (11) A carrying-case.

The entire apparatus fits into a small, wood carrying-case and can be used under field conditions anywhere. The test made with this equipment indicates not only the presence of acidity, but also the degree of acidity and amount of lime needed.

Simple to Use

In using the apparatus, the operator selects a representative patch of a few square rods and takes a little soil from the plowed layer in 5 or 10 places in this small area, making altogether a sample of about one-half cupful. Samples are placed in clean paper or cloth sacks which may be marked. Grass, manure, and surface rubbish are scraped off before the sample is taken. When fields vary widely in fertility or have many knolls and low places, it is best to take several entirely separate samples from different parts of the field. If part of a field is high and part low, separate samples should be taken, and in no case should soil from the high land and the low be mixed in making up a sample. Different parts of a field often vary greatly in acidity. When the samples have been taken, the operator removes the water can and brass heater from the case, adjusts the wick, places the lamp in the heater, with the perforated disk radiator over the neck of the lamp, and hooks the triangular flask support over the top of the heater, and the tester is ready for use.

In making a soil test with the Truog tester, a mixed and pulverized soil sample is placed in the flask. To this is added a level spoonful of chemicals. Enough distilled or rain water is added

to bring the contents of the flask up to the 100-cc. mark. The flask is then shaken and placed on the heater, and it begins to boil in about 5 to 7 minutes. After the contents have boiled exactly 1 minute, a strip of lead acetate paper, which has been moistened with two drops of water, is pressed firmly over the top edges of the flask and is allowed to remain in place while the contents of the flask boil another 2 minutes. The test paper is then removed. If the soil is acid, the under side of the paper will be darkened. The greater the acidity the darker will be the paper. The test paper is dried by placing it on the partly cooled flask-support. It is then compared with the standard acidity and lime chart, and the degree of acidity and the amount of lime needed can be accurately determined.

By making field tests possible, and with a procedure so simple that almost anyone can operate the device, the Truog Test has done a great deal to promote the testing of soil. If Emil Truog had done nothing else of importance, this apparatus alone would survive as an important aid to the American farmer.

Fertilizer Application

Among the many theories advanced by Professor Truog was his idea that the broadcast method of applying fertilizer was wrong for many crops. During his studies he found that fertilizers for corn applied in the hills or drill rows gave much better results, as did the same methods applied to potatoes. He also found that the broadcast method gave better results for certain other crops. In 1925 the National Fertilizer Association provided a fellowship for research work in this connection. The studies were carried out by Emil Truog and associates, and the findings published in Bulletin 65 of the University of Wisconsin. In this we find that "fertilizers are added to soils for the purpose of supplying plant-food elements which are present in too small an amount or in an unbalanced proportion. Aside from increasing yields, fertilizers when properly used may produce a number of desirable results, as follows:

1. The quality of the crop may be improved.
2. An early growth, root development, and hardiness may be promoted.
3. Lodging may be lessened.
4. Maturity may be hastened.
5. Danger of injury from frosts and other unfavorable weather conditions, as well as from insects and diseases, may be lessened.

"The present investigation was undertaken for the purpose of studying the various effects which fertilizers have on crops. It was soon found that the method of applying the fertilizer has a very important bearing on the results that may be obtained, and hence a considerable portion of the present investigation may be devoted to a study of methods of application.

"Fertilizer usage may be divided into two kinds. There is first the use of fertilizers, especially phosphates, in comparatively heavy broadcast applications for the purpose of building up the basal supply of essential elements which are known to be too low in the soil under consideration for practically all crops. Second, there is the use of fertilizers in a concentrated way in the hill or drill row to supply special needs of certain crops and conditions, so as to produce the various favorable effects mentioned. By using a fertilizer according to the second method it is possible to surround the young plant with a much higher concentration of essential elements than is practicable with the ordinary broadcast applications, and hence it should be possible to promote early growth and some of the other favorable effects on the young plant with much less fertilizer and at a less cost than with the broadcast method.

"The use of fertilizer in the hill or drill row, however, involves certain problems which must be recognized if

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Improving Pastures In New Brunswick

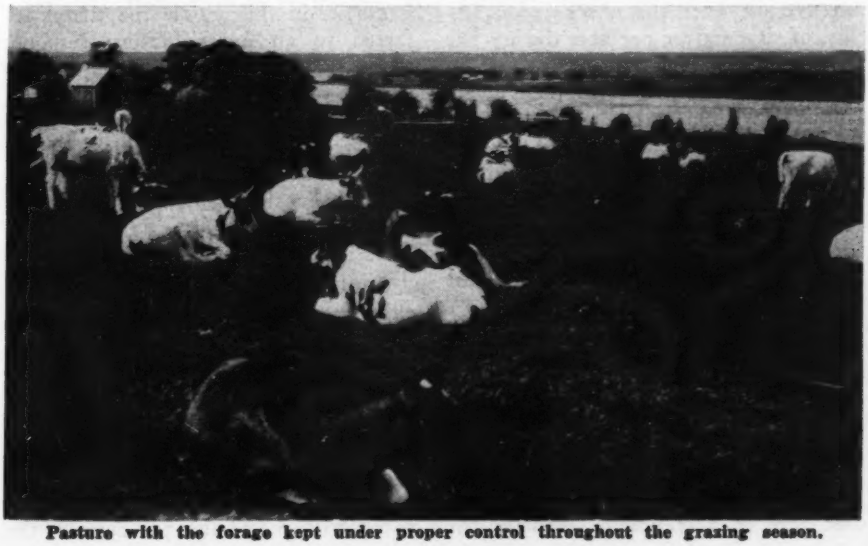
By C. F. Bailey

Superintendent, Experimental Station, Fredericton, N. B.

PASTURE investigations at the Dominion Experimental Station, at Fredericton, have provided rather surprising results. When they were begun in 1923, basic slag was being advertised extensively as a pasture fertilizer. At that time there did not seem to be any reason for doubting the value of this product, because the soils in the Maritime Provinces are practically all low in phosphorus and have a low pH. It also had been used extensively in Europe as a pasture fertilizer.

The tests first started at Fredericton were designed to determine the value of basic slag, superphosphate, and lime as pasture dressings. Ground limestone was used alone at 2,000 and 4,000 lbs. per acre; basic slag was applied at rates ranging from 250 to 1,000 lbs. per acre; superphosphate was applied at rates providing the same quantity of phosphorus as the slag. Similar quantities of superphosphate were used in combination with 1,000 and 2,000 lbs. of limestone per acre. All plots were in duplicate.

While the yields were slightly larger than the checks in all cases, the increases were not sufficient to justify the use of basic slag, superphosphate, or lime; also the stand of plants remained weak and thin, and a heavy stand of moss gradually became established. A grazing experiment was established adjacent to these plots in which basic slag was used at the rate of 750 lbs. per acre the first year; three years later an additional 750 lbs.



Pasture with the forage kept under proper control throughout the grazing season.

of basic slag were applied. Four years' records showed practically no difference between the treated and untreated fields.

Immediate Results

In 1929, a new series of plots was established to determine the value of slag, superphosphate, and lime when applied to newly seeded areas, with the results much the same as in the former experiment. One range of these plots was top-dressed with 100 lbs. of nitrate of soda, 280 lbs. 20% superphosphate, and 100 lbs. muriate of potash per acre before the 1932 grazing season. These plots improved almost at once, and produced 1,424 lbs. of dry matter per acre in excess of the checks that year, and an average increase of 1,219 lbs. of dry matter for the past four years.

The results from the use of nitrogenous fertilizers alone on pastures also have been disappointing. A top-dressing of 100 lbs. of nitrate of soda per acre, applied each spring for four consecutive years, gave an average increase over checks of only 70 lbs. of dry matter per acre. Adjoining plots, with 280 lbs. 20% superphosphate and 100 lbs. potash per acre added to the nitrate of soda each year, produced an average over the checks of 1,315 lbs. of dry matter per acre during the same period. It is also of interest to note that when these minerals were applied without the nitrogen, the yields over the check averaged 898 lbs. of dry matter per acre. To put it another way, if we value the fertilizer used at 1935 prices, the increase of dry matter over the check, from plots treated with nitrate of soda alone cost $50 per ton, as compared with $8.71 per ton dry matter when a complete fertilizer was used. When only superphosphate and potash were used, the increase of dry matter over the check cost $8.86 per ton.

In 1932, a project was begun to determine the amount of potash required per acre in a complete fertilizer for best results when applied to pastures. Results of four years' work would seem to indicate that an annual application of 100 lbs. of muriate of potash will give somewhat better results than when 50 lbs. are applied annually. For example, the yield of dry matter over the checks when 100 lbs. were applied, was an average of 1,587 lbs. whereas, the yield of dry matter when 50 lbs. were applied, was 1,151 lbs. If put on a basis of cost, we find that the increase of dry matter over the checks cost $7.22 per ton in the former case and $8.65 per ton in the latter.

Apply Potash Annually

When 280 lbs. of 20% superphosphate and 100 lbs. of nitrate of soda were used without the addition of potash, the yield over the check was only 589 lbs. of dry matter per acre, and the cost of the dry matter produced over the check was $14.36 per ton. This experiment also seems to indicate that there is very little residual effect from potash the second year. In other words, it would appear to be good practice to apply small amounts of potash every year rather than liberal amounts every two, three, or four years.

Earlier in this article the writer referred to an unsatisfactory response received from lime when applied to pasture plots alone and in combination with superphosphate or slag. Later investigations seem to indicate that more encouraging results may be secured from the use of lime on pasture lands with a low pH, provided a complete fertilizer is being used.

In 1930, one half of each of the experimental paddocks used for grazing experiments was limed at the rate of 2,000 lbs. of ground limestone per acre. While no improvement has been observed by the naked eye, the caged areas gave an average yield of dry matter for three years of 7,652 lbs. per acre on the limed area, compared with 6,804 lbs. per acre on the

unlimed area. The same results have been secured from mowed plots where a complete fertilizer was used, but in no case has a satisfactory response been secured from lime when applied alone with superphosphate.

This pasture illustrates the effects of under-grazing.

While the results of the work at Fredericton are quite definitely in favor of a complete fertilizer for pastures, yet it is difficult to state the proper amount that should be applied per acre for the most economical results. Up to the present time this station has been applying 280 lbs. of 20% superphosphate and 100 lbs. of muriate of potash per acre every two years, and 150 lbs. of nitrate of soda annually to all experimental paddocks used for securing grazing records. While these pastures have been developed to a high state of perfection by this treatment, there is experimental evidence to show that the present fertilizer treatment could probably be improved upon.

To begin with, potash should be applied annually, if we are to be guided by the results of experiments previously referred to. It is also found that the year the nitrate of soda is applied alone, a larger percentage of the season's growth is secured during the flush period of growth, whereas, the year the complete fertilizer is applied, the yield of grass will be much better distributed over the pasture season. The following table giving the results secured from plots top-dressed with 240 lbs. superphosphate 20%, 75 lbs. of muriate of potash, and the equivalent of 160 lbs. of nitrate of soda in 1933, and the same amount of nitrogenous fertilizer alone in 1934, illustrates the difference in growth which is apparently due to the fertilizer treatment.

1933 COMPLETE FERTILIZER

Date Cut	Pct. total increase in each cutting
June 6	48.46
June 29	24.01
August 5	17.87
September 14	9.66

1934 NITROGENOUS FERTILIZER

Date Cut	Pct. total increase in each cutting
June 7	88.94
June 28	3.05
July 30	7.46
September 15	0.55

NOTE: Both 1933 and 1934 were dry summers.

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Mr. Ebe's Side-line Is Certified Seed

By C. A. Whybark
Puyallup, Washington

POTATO growing is one of the leading agricultural industries on the Pacific Coast, and requires seed potatoes of highest quality. This need is being met by numerous growers who now produce certified seed by keeping their fields free from disease and pests, and producing uniform, well-shaped stock which is true to type.

Oscar Ebe, of Custer, Washington, is one of the outstanding growers of certified seed potatoes in the Pacific Northwest. For a number of years he has been growing the crop as a side-line on his dairy farm in Whatcom county, Washington, a locality well suited because mosaic and other virus diseases are easily detected and insect pests are not numerous.

Oscar Ebe, showing his alfalfa field before first cutting.

Mr. Ebe has made a practice of using a clover or other meadow for potatoes, as he finds they do better following sod than following either small grain or corn. Best results have been obtained by plowing the land twice. The first plowing is done in the fall, to a depth of about three inches. In the spring the land is double-disced as soon as it can be worked. The second plowing is done shortly before planting, at a depth of about eight inches. The land is then disced again and harrowed until in good condition for planting.

The seed is treated with corrosive sublimate and cut in 2-oz. pieces. About 1,000 lbs. of seed are used per acre. The crop receives shallow cultivation as often as necessary to conserve moisture and keep down weeds. When plants are from 4 to 6 in. high, they receive their first roguing. Every doubtful plant is removed during the growing season.

Mr. Ebe grows both certified White Rose and Irish Cobblers. He prefers the White Rose, as this variety yields more heavily, keeps longer in good condition, and is adapted for both late and early planting. Enough seed is planted in units to furnish seed for his next season's crop, and special care is given this plot. Through hill selecting, unit planting, and careful roguing, he has built up a high-yielding strain of both varieties.

The use of fertilizers high in potash

A perfect stand and uniform growth of certified White Rose potatoes on the Oscar Ebe farm.

has proven a very favorable influence on the production of certified seed. Applications of such fertilizers help the potato plants to resist diseases and produce uniform tubers of true type.

Mr. Ebe says, "I have been using commercial fertilizer containing potash for the past 10 years and have always found good results on my upland, sandy loam soil. Very good results have also been obtained on alfalfa with fertilizer containing a high percentage of potash. I now have 10 acres of alfalfa where a few years ago it was thought alfalfa could not be grown."

His convictions about the use of potash and fertilizer in general are not based on guesswork, but upon fertilizer tests which he has made in the past. The results of one of these tests on potatoes are shown below.

The present fertilizer program on this farm consists of 9 or 10 loads of farm manure supplemented with 1,000 lbs. of 3-10-10 mixed fertilizer per acre. The manure is spread as convenient, and is plowed under at the time of the second plowing. The commercial fertilizer is applied at planting time with a fertilizer attachment.

"Since using mixed fertilizer high in potash together with certified seed," Mr. Ebe states, "I find my yield is about double that which I used to consider an average crop. I get a yield of 10 or 12 tons per acre, and the potatoes are smoother and more uniform than I can get without the use of potash. I also find that the plants withstand dry weather better."

Local demand for the certified seed produced on this farm has always been good, and Mr. Ebe is now developing a fine reputation in outside markets, such as Eastern Washington and California, for his Irish Cobbler and White Rose varieties. He has recently acquired a warehouse and storage facilities in the city of Bellingham, Washington, to accommodate this profitable side-line of his, which the intelligent use of fertilizer has helped to establish.

Per Acre Treatment	Yield Per Acre in Lbs. Marketable	Culls	Per cent Culls	Increase Lbs. Marketables
Without fertilizer	7,922	1,281	14%	....
800 lbs. 3-10-10	10,500	1,190	10%	2,578
800 lbs. 3-10-15	11,610	300	2½%	3,688

Harvesting operations in southern Indiana. The sweet potatoes are field graded—the No. 1's are picked up first, and after curing are graded again before going on the market.

Hoosier-grown Sweets Meet Market Demands

By W. B. Ward

Extension Horticulturist, Purdue University

VARYING amounts and analyses of fertilizer have been used from time to time on sweet potato soils, and various results have been obtained. Perhaps no two sections of the sweet potato area in the United States have the same soils or climatic conditions and, therefore, the fertilizers and the amounts applied per acre differ.

For a number of years the general recommendation for Indiana sweet potatoes has been 500 to 600 lbs. of 2-8-16 or 3-9-18 per acre applied in the row. This amount of fertilizer, as a rule, is applied from 3 to 10 days before plant-setting time, yet occasionally some grower omits the row application and side-dresses the plants 10 days to 2 weeks later with 750 to 1,000 lbs. of the same analysis. Good results have been obtained through these methods of fertilization. Some soils, however, require a different treatment as to the amount and analysis of fertilizer, depending somewhat upon the soil-building program used by the grower. A good yield of quality sweet potatoes is what the grower desires.

The most commonly grown variety in Indiana from the commercial standpoint is the Little Stem Jersey, and the

yields have been comparable to the yields from other states and other varieties. When the average grower uses average methods, the results are easily tabulated, as the yields will be in the 100-bushel group with about 50% of the potatoes saleable as No. 1's. The better grower uses better methods, studies his market, takes better care of his crop, and in the end, for a few extra dollars spent for fertilizer, his yields are in the 300-bushel class with the sweet potatoes grading from 75 to 90% No. 1's.

Alfred Owen, Poseyville, is a contractor and, as a side-line in 1934, planted 22 acres to sweet potatoes. His sand farm was better than the average for fertility, yet at harvest time he gathered only 800 bushels of what he called "miserable" potatoes. Owen knew that in his contracts business methods had to be used, and that some slip on his part might spell disaster. After the experience with his sweet potato crop, he wondered why the same business principles used in his other work couldn't apply to sweet potato production.

One field of 8 acres looked promising for his 1935 crop, but he didn't think he could get enough sweets from that small an acreage. He wanted about 2,000 bushels of marketable sweets, and unless better methods of growing would help insure a good yield, he was going to plant more acres. In going over the past history of one field, it appeared as if here was a place for a good demonstration on the uses of additional fertilizers. This 8 acres was in pasture in 1932 and 1933, and sand pasture is not much. During late fall of 1933 and the spring of 1934, 110 loads of manure had been scattered over the field. This field was then plowed and planted to cowpeas. The peas grew well, rotted down in the late summer, and in early fall a cover crop of rye was seeded to keep the sand from blowing and for additional organic matter. This culture looked promising for a high yield in 1935.

Samples of sand were taken in March and tested for acidity, available phosphoric acid, and potash. The pH was 6.5, phosphorus medium, and potash high plus. At this point Owen made the remark that it would be nice if he could raise 2,200 bushels from the 8 acres and just reverse the conditions of the past year when it was 22 acres and 800 bushels. The question then was what to do next, what to fertilize with and how much, or was any additional fertilizer necessary. The recommendations were a mixture of 200 lbs. of 20% phosphate and 300 lbs. of muriate of potash per acre

Our cooperator, Alfred Owen, with a sample of his sweet potatoes. Although higher yields were produced in Indiana in 1935, no other grower got the thrill from his crop that Owen did.

The mulched area is in the foreground. The light spot to the right shows the straw.

drilled in on the rye and plowed under. Owen wanted to mix his own fertilizer in his concrete mixer, and an 0-8-30 resulted. Six hundred pounds per acre were drilled in on March 5, with the exception of three drill widths wide. The field was plowed the first part of April, and planting operations began on May 10. A transplanter was used.

To aid in the control of stem rot or wilt, all rooted stems were treated with an organic mercury compound. This gave a uniform stand throughout the season, as only four infested plants were found in the 8 acres. These plants may have resulted from a few transplants that did not receive the root treatment.

The unfertilized area was plotted with (a) 3 rows, no fertilizer; (b) 3 rows, 600 lbs. of 2-8-16 fertilizer per acre. Three rows on one side had the same application in the row plus the previous 600-lb. application of 0-8-30. One hundred feet of two plots (a and b) were mulched with straw on June 17. Previous records on mulching sweet potatoes with straw gave very promising results.

The 1935 growing season was not very favorable because of the lack of rainfall in this section and also some exceptionally warm weather. Very little difference was noted in the growth of vines throughout the summer, and the plant-tissue test, August 22, indicated all plots low in nitrogen but high in potash and phosphorus. One good rain came in early September, but an uncalled-for and unexpected frost the first of October stopped further development of the roots. Harvesting operations began on October 14. As the plow was turning out the first rows on the far side of the field, Owen knew that his ambition was a reality or so close to it that it would make but very little difference. Bright, smooth, chunky sweet potatoes began to show up on top of the sand—a high percentage of No. 1's and not many 2's. The field averaged 271 bushels per acre and came so close to the 2,200 bushels that Owen made this remark, "The only way to grow a good crop of sweet potatoes is to have a crop failure the year before."

The sweepstakes ribbon for the bushel exhibit at the Tri-State Fair and Sweet Potato Show at Evansville, Ind., last fall was awarded to Owen, and the same sample won sweepstakes over all sweet potato entries.

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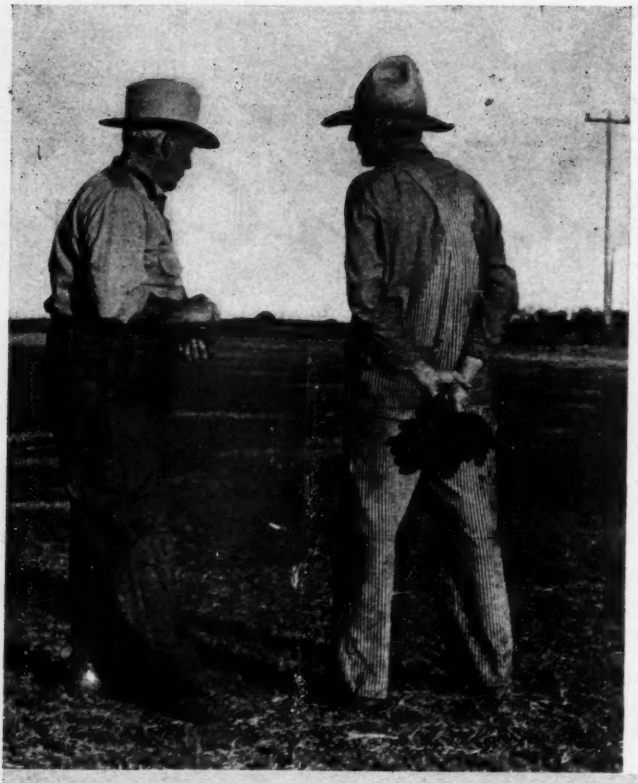
Pictorial

"WANNA BUY A DUCK?"



Left: "Well, I don't know, John, I believe I'd have used more fertilizer."

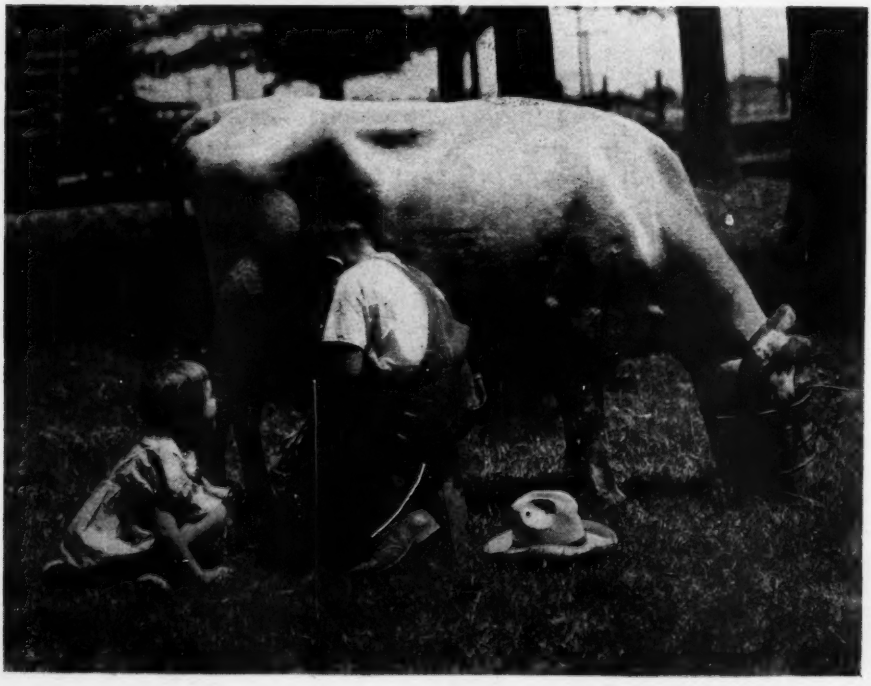
Below: "I'm willing to bet he'll carry this county by eighty votes."

Above: Horse power at its best—perfect coordination and efficient results.

Right: Horse power and man power lengthen days in busy seasons.

Above: A friendly triumvirate.

Below: Direct to the consumer.



The Editors Talk

Potash Prices

A statistical study of potash prices over the past few years shows that the price level of potash salts dropped much below that of general prices. During the recent period of rising prices, potash prices still held at a much lower level than that of other materials the farmer buys or sells. Potash is now relatively one of the cheapest products which a farmer buys, a situation strongly favoring recommendations for adequate usage to insure profitable yields of quality crops.

In 1929 and 1930 prices in general began a steady decline, which reached the depression low in March and April, 1933, and then began the gradual rise which brought them in March, 1936, to 79.6% of the 1926-1928 average. The level of prices of commodities purchased by farmers followed the same course, reaching its low point in 1933 and advancing to 78.3% of the 1926-1928 average in March of this year.

Potash prices in March, 1935, reached their lowest point in history and in March of this year stood at 64.2% of the 1926-1928 average, approximately half the price levels of January, 1931.

In general, prices paid by farmers tend to lag during a period of falling prices and tend to rise faster during a period of rising prices. Potash prices, however, are an exception to this rule in that the rise has been much slower than that of other materials the farmer buys or of the products he sells.

It is a well-known fact that for many years American agriculture has been removing from our soils much more potash than has been added in fertilizers. In addition to this, almost unbelievable amounts of plant food have been lost through soil erosion. The depletion of the natural fertility of our soils cannot continue indefinitely in this manner, and this is being reflected in lower yields of poorer quality crops on many soils that formerly were considered to contain practically unlimited supplies of potash. Furthermore, many soils which showed by analysis large amounts of total potash have now been found to be lacking in available potash necessary to support the demands for profitable yields.

The present relative cheapness of potash, together with the increased farm income makes most opportune the sufficient use of potash not only on this year's crops, but for rebuilding the fertility of run-down soils.

IIIIIIIIIIIIIIII

Midwest Improves

Farmers in the Midwest are in a more favorable financial position than for some years, according to numerous indications. The Bureau of Agricultural Economics of the U. S. Department of Agriculture reports that the cash receipts of farmers in this section of the country have increased about 20% in 1935, compared to 1934. The significance of this improvement is emphasized when it is considered that the nine states included in these figures had a total income from sales of farm products and benefit

payments this past year of more than $2,400,000,000, representing about 35% of the farm receipts for the whole country.

This improved situation in agriculture is being reflected in general business conditions in the Midwest. Sales of farm equipment, fertilizers, and general merchandise are ahead of last year; sale of farm land is improving; collections are very good; loans are being repaid. All of these are signs of improved times for the farmer.

"Another Sign of Better Times" is the title of a short editorial which appeared in the March 14 issue of the Wisconsin Agriculturist and Farmer, and which we quote below:

> "One of the best barometers we know about to indicate the trend of popular opinion on agricultural extension, which rises and falls in turn with the economic condition of the times, is the recorded votes of county boards of supervisors on county agent work.
>
> "Only a glance shows this clearly. The percentage of total favorable votes to the entire membership of the county boards thus voting on county agent work in the past six years is as follows: 1930, 93 per cent favorable; 1931, 85.5 per cent; 1932, 73.5 per cent; 1933, 86 per cent; 1934, 94.5 per cent; 1935, practically 95 per cent favorable.
>
> "When times got tough in 1931, 1932 and 1933 the opposition to extension work increased and the defense became less vigorous. With the return of better prices and conditions to farming, we see the recorded votes of supervisors in more than 45 counties of Wisconsin in 1935 sweep up again to the 95 per cent mark, favorable to retaining the county agent's services. This is a fine thing after all, for it makes the county agent system instantly responsive to and ready to aid all practical programs having prosperity as the ultimate goal. If county agents were appointed for life, like the supreme court, their community of interest with the farmer and his family would be considerably less effective."

True of Wisconsin, this situation undoubtedly is true of what is happening in other states and speaks promise for the continuation of the improvement in agricultural conditions.

IIIIIIIIIIIIIII

Pasture Progress

During recent years a great amount of work and interest in the improvement of pastures has been done and recorded. Relatively young in its inception on the American continent as compared to Europe, "pasture consciousness" can be traced back to our pre-depression days when milk prices forced dairymen into a more intensive study of the economics of milk production. However, much credit has been accorded the fertilizer industry, which in seeking new outlets for its products closely cooperated with agricultural institutions on projects and investigations that have resulted in making good pastures a profitable crop for farmers.

Better Crops With Plant Food has always been interested in the pasture movement, and we have published many articles by prominent authorities on pasture problems. In this issue we are pleased to present to our readers another article, "Improving Pastures in New Brunswick," by C. F. Bailey, Superintendent of the Experimental Station, Fredericton, New Brunswick. This story details practical experience and results which will be of interest to many other regions.

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

"Substitution of Commercial Fertilizers for Manure in Vegetable Production," by J. W. Lloyd and E. P. Lewis (University of Illinois Agricultural Experiment Station Bulletin 421), reports very valuable information for growers engaged in intensive vegetable production. Eight years of experimental work with fertilizers for 10 market-garden crops are summarized. In a previous bulletin published by this Station, Number 377, results for five years of work were given. The present bulletin, however, affords a more comprehensive basis for conclusions regarding the use of fertilizers for vegetable crops. The crops used in these experiments were spinach, lettuce, beets, peas, beans, potato, tomato, pepper, cauliflower, and carrot. The experiments were conducted at the Cook County Experiment Station.

In spite of the scarcity and high price of manure, the authors state yields of vegetable crops need not be seriously affected, as commercial fertilizers are capable of replacing manure to a large extent. They point out that one half the manure replaced by commercial fertilizers resulted in even higher yields than those obtained from the full manure treatment. It is also shown that when all the manure was replaced by commercial fertilizers, although the yields were smaller at times, such a treatment was more economical with most crops studied than the basic manure application. Complete fertilizers were more conducive to high yields than incomplete fertilizers when no manure was used. For most crops complete fertilizers, such as 4-8-6 or 6-8-6, applied at the rate of 1,000 pounds per acre, gave good results. When manure is not economical, it is believed complete fertilizers may be used just as effectively, provided organic matter is supplied in the form of cover crops.

"Official Inspections, Commercial Fertilizers, 1935," Agr. Exp. Sta., Orono, Me., No. 157, Oct. 1935, Elmer R. Tobey.

"Commercial Fertilizers, Commercial Feeds and Agricultural Liming Materials," Univ. of Maryland, College Park, Md., Control Series, No. 155, July 1935, and No. 157, January 1936.

"Fertilizer Analyses and Registrations, 1935," Dept. of Agr., Div. of Feed and Fert. Control, St. Paul, Minn., H. A. Halvorson.

"A Compilation of Experimental Data on Cotton Fertilizers Applicable to the Hill Sections of Mississippi," Agr. Exp. Sta., State College, Miss., Bul. 309, Mar. 1935, C. F. Clark.

"Fertilizer Placement for Cannery Peas," Agr. Exp. Sta., Geneva, N. Y., Bul. 659, Jan. 1936, Charles B. Sayre and G. A. Cumings.

"Fertilizers for Different Crops Including the Best Percentages of Water-Insoluble Nitrogen of Total in Fertilizer Mixtures," Agr. Exp. Sta., State College Station, Raleigh, N. C., Agron. Information Cir. 96, Nov. 1935.

"Suitable Fertilizer Mixtures for Different Crops Including the Functions of Chief Plant Nutrients," Agr. Exp. Sta., State College Station, Raleigh, N. C., Agron. Information Cir. 97, Jan. 1935, H. B. Mann and W. H. Rankin.

Soils

Many useful suggestions for growing onions on muck soils are contained in Michigan State College Extension Bulletin 123 (revised) entitled "Muck Soil Management for Onion Produc-

tion," by Paul M. Harmer. Discussed in the bulletin are practical methods on soil management, varieties, seeding and transplanting, insect pests, and harvesting and storing. One of the chief requisites to successful onion production on mucks is a satisfactory soil reaction. Testing the soil to determine its reaction is strongly advised. Extremely acid soils may not produce well, even after liming. Moderately acid as well as slightly to strongly acid mucks show beneficial responses from applications of copper sulphate when lime is required. Sulphur and manganese sulphate used on alkaline mucks result in increased yields, better maturity, and better keeping qualities of the crop. Fertilizer mixtures and the method and rate of application best adapted under different circumstances are given, both for broadcast fertilization either on the surface or drilled uniformly over the field, and for row application. The author relates that generally the amount of fertilizer which can be safely put in the row is insufficient for producing optimum yields, and should be supplemented by enough fertilizer broadcast before seeding to bring the total application to 600 to 800 pounds per acre. In the opinion of the author, on fields which ordinarily require 900 to 1,000 pounds of a 2-8-16 mixture, it is frequently advisable to use one mixture for broadcasting and another for the row application. Thus, using 300 pounds of 3-12-15 or 2-8-16 in the row and 300 to 500 pounds of 0-8-24 broadcast cuts down the cost of fertilizer and also the required amount per acre. Other mixtures of similar ratios which might be used are given.

"Oxidation of Sulphur in Arizona Soils and Its Effect on Soil Properties," Agr. Exp. Sta., Tucson, Ariz., Tech. Bul. 59, Dec. 15, 1935, W. T. McGeorge and R. A. Greene.

"Sand Culture of Seedlings," Agr. Exp. Sta., New Haven, Conn., Bul. 380, Jan. 1936, A. A. Dunlap.

"Relation of the Degree of Base Saturation of a Colloidal Clay by Calcium to the Growth, Nodulation and Composition of Soybeans," Agr. Exp. Sta., Columbia, Mo., Res. Bul. 232, Jan. 1936, Glenn M. Horner.

"Broad Relationships Between Microorganisms and Soil Fertility," Agr. Exp. Sta., New Brunswick, N. J., Bul. 595, Nov. 1935, Jacob G. Lipman and Robert L. Starkey.

"Soils of Orleans County, New York, in Their Relation to Orchard Planting," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., Bul. 637, Sept. 1935, A. T. Sweet.

"Lysimeter Investigations, IV. Water Movement, Soil Temperatures, and Root Activity Under Apple Trees," Agr. Exp. Sta., Geneva, N. Y., Tech. Bul. 237, Oct. 1935, R. C. Collison.

"Soil Fertility in Relation to Productive Land Value," Agr. Exp. Sta., Corvallis, Oreg., Sta. Cir. 113, Oct. 1935, W. L. Powers.

"Relation of the Occurrence of Cotton Root Rot to the Chemical Composition of Soils," Agr. Exp. Sta., College Station, Texas, Bul. 522, Dec. 1935, G. S. Fraps and J. F. Fudge.

"Soil Moisture and Irrigation Investigations in Eastern Apple Orchards," U. S. D. A., Washington, D. C., Tech. Bul. 491, Oct. 1935, J. R. Magness, E. S. Deman, and J. R. Furr.

"Soil Survey of the Lovington Area, New Mexico," U. S. D. A., Washington, D. C., Series 1932, No. 2, W. G. Harper and L. H. Smith.

"Soil Survey of Kiowa County, Oklahoma," U. S. D. A., Washington, D. C., Series 1931, No. 14, A. W. Goke and C. A. Hollopeter.

Crops

According to the Iowa Agricultural Experiment Station Bulletin 339, entitled "Effect of Harvesting, Spacing, and Age of Plants on Yields of Asparagus" by E. S. Harber, plant spacing has a direct effect on quality of asparagus spears. The type of soil, fertility, and cultural operations influence the spacing distance, asserts the author. Under Iowa conditions, results show that a 3-foot spacing is best, while spacing 1 foot apart decreases average weight of spears. These investigations indicate one-year plants are slightly better than two-year plants for starting a plantation, especially considering the higher price for the older plants. One-year-old transplanted plants gave superior results over seed sown in the field where the plants are to grow permanently, or seed sown in pots and transplanted to the field. It is generally conceded that when asparagus is planted in the spring, the spears should not be cut

the following season. Cuttings of the second season should be limited to a short period, and it may pay to wait two years to start commercial cutting, the publication concludes.

In Extension Circular 207, North Carolina State College of Agriculture, entitled "Approved Practices in Handling Tobacco Beds," the Department of Agronomy, Botany, and Zoology explain briefly, yet concisely, the considerations which are necessary for obtaining healthy tobacco plants.

"The first step in the production of a successful tobacco crop is to have thrifty, healthy plants ready when the proper time for transplanting arrives," the authors stress. Among the chief causes of plant-bed failures given are poor plant-bed sites, inadequate soil preparation, improper fertilization, diseased seed and/or plants, incorrect handling of beds during the growth period of plants, and insects. The value of selecting good varieties, proper seed-bed fertilization, good care of the beds throughout the growth period of plants, and other important phases of ideal management include the major topics embracing the discussions. It is advised that tobacco trash should not be placed on plant beds because it may carry such diseases as mosaic, black root rot, or Granville wilt.

"Twenty Years of Agricultural Extension Work in Arizona," Agr. Ext. Serv., Univ. of Arizona, Tucson, Ariz., Ext. Proj. Cir. 15, June 1935, P. H. Ross, Director.

"Irrigation Experiments with Wheat," Agr. Exp. Sta., Tucson, Ariz., Bul. 151, Dec. 15, 1935, A. T. Bartel and Charles Hobart.

"Some Aspects of Citrus Tree Decline as Revealed by Soil and Plant Studies," Agr. Exp. Sta., Tucson, Ariz., Tech. Bul. 60, Feb. 15, 1936, W. T. McGeorge.

"Forty-seventh Annual Report for Fiscal Year Ending June 30, 1935," Agr. Exp. Sta., Fayetteville, Ark., Dec. 1935, C. O. Brannen, Acting Director.

"Sulfuric Acid for Control of Weeds," Agr. Exp. Sta., Berkeley, Calif., Bul. 596, Nov. 1935, W. E. Ball and O. C. French.

"Cutting Experiments with Bahia Grass Grown in Lysimeters," Agr. Exp. Sta., Gainesville, Fla., Tech. Bul. 286, Nov. 1935, W. A. Leukel and R. M. Barnette.

"Pasture Value of Different Grasses Alone and in Mixture," Agr. Exp. Sta., Gainesville, Fla., Bul. 289, Jan. 1936, Geo. E. Ritchey and W. W. Henley.

"Comparative Productiveness of Missionary Strawberry Plants from Arkansas and Maryland," Agr. Exp. Sta., Gainesville, Fla., Press Bul. 489, Mar. 1936, A. N. Brooks.

"Fifteenth Annual Report, 1934-1935," Coastal Plain Exp. Sta., Tifton, Ga., Bul. 25, S. H. Starr, Director.

"Grape Growing in Kansas," Agr. Exp. Sta., Manhattan, Kans., Cir. 177, Aug. 1935, R. J. Barnett.

"Practices in Seeding Meadow and Pasture Crops," Univ. of Kentucky, Agr. Ext. Div., Cir. 242 (3rd Ed., Rev.), E. J. Kinney, Ralph Kenney, and E. N. Fergus.

"Report of the Director for the Year Ending June 30, 1934," Agr. Exp. Sta., Columbia, Mo., Bul. 358, Dec. 1935, F. B. Mumford and S. B. Shirky.

"Korean Lespedeza in Rotations of Crops and Pastures," Agr. Exp. Sta., Columbia, Mo., Bul. 360, Feb. 1936, W. C. Etheridge and C. A. Helm.

"Sweet Clover in Missouri," Agr. Ext. Serv., Columbia, Mo., Cir. 329, Oct. 1935, W. C. Etheridge and C. A. Helm.

"The Relation Between the Vitamin A Content of the Dairy Ration and of Milk," Agr. Exp. Sta., New Brunswick, N. J., Bul. 592, Sept. 1935, Walter C. Russell, M. W. Taylor, D. F. Chichester, and Logan T. Wilson.

"Early Results of Peach Breeding in New Jersey," Agr. Exp. Sta., New Brunswick, N. J., Bul. 599, Jan. 1936, M. A. Blake and C. H. Connors.

"The Home Vegetable Garden," Agr. Ext. Serv., State College, N. Mex., Ext. Cir. 126, Mar. 1933 (Rev. Aug. 1935), G. R. Quesenberry, Director.

"Forty-eighth Annual Report, 1935," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., Carl E. Ladd, Director.

"Burley Tobacco Culture," Agr. Ext. Serv., Knoxville, Tenn., Rev. Pub. 161, Mar. 1935, Roy H. Milton.

"Forty-seventh Annual Report, 1934," Agr. Exp. Sta., College Station, Texas, A. B. Conner, Director.

"Twentieth Annual Report, Cooperative Extension Work in Agriculture and Home Economics for Year 1934," Agr. Ext. Serv., Burlington, Vt., Ext. Bul. 20, June 1935, J. E. Carrigan, Director.

"Department of Agriculture-Immigration of Virginia," Richmond, Va., Bul. 334, Feb. 1936, and Bul. 335, Mar. 1936.

"Forty-fifth Annual Report for the Fiscal Year Ended June 30, 1935," Agr. Exp. Sta., Pullman, Wash., Bul. 325, Dec. 1935, Edw. C. Johnson, Director.

"Top and Double-Working Apple Trees," Agr. Exp. Sta., Madison, Wis., Bul. 432, Jan. 1936, R. H. Roberts.

"Report of the Chief of the Bureau of Plant Industry, 1935," U. S. D. A., Washington, D. C., Frederick D. Richey, Chief.

"Vernalization Experiments with Forage Crops," U. S. D. A., Washington, D. C., Cir. 377, Nov. 1935, Roland Mckee.

Economics

One of the most interesting new publications under this division is Florida Agricultural Experiment Station Bulletin 287, entitled "Economic Study of Absentee Ownership of Citrus Properties in Florida." H. W. Hawthorne of the U. S. D. A. and J. E. Turlington of the University of Florida, co-authors, present worthwhile data concerning out-of-state ownership. These data also will be of interest to those contemplating the purchase of citrus property in the future. The information is compiled from the response of 477 absentee owners who replied to a complete questionnaire sent them. The records gave a vivid picture of methods employed in caring for the groves, harvesting, packing and marketing, size of properties, age of trees, cash costs and receipts, taxes, fertilizers, and other pertinent facts of interest to this class of ownership. The report shows that the absentee owners reporting reside in 35 states of the United States, in the District of Columbia, the Territory of Hawaii, the Dominion of Canada, and in Cuba.

"Agricultural Outlook for Illinois, 1936," Agr. Exp. Sta., Urbana, Ill., Cir. 442, Dec. 20, 1935, H. W. Mumford, Director.

"Prices of Illinois Farm Products, 1931-1934," Agr. Exp. Sta., Urbana, Ill., Bul. 422, Dec. 1935, L. J. Norton and T. R. Hedges.

"Types of Farming in Kentucky," Agr. Exp. Sta., Lexington, Ky., Res. Bul. 357, June 1935, Bruce Poundstone and Walter J. Roth.

"Part-time Farming in Four Representative Areas of Kentucky," Agr. Exp. Sta., Lexington, Ky., Bul. 358, Aug. 1935, Merton Oyler and W. W. Rose.

"New Jersey Prices of Hired Farm Labor, Feedstuffs, and Fertilizer Materials, and Their Index Numbers, 1910-1934," State Dept. of Agr., Trenton, N. J., Cir. 252, June 1935, D. T. Pitt.

"Farm Economics," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., No. 93, Feb. 1936.

"Wholesale Prices at Cincinnati and New York," Cornell Univ. Agr. Exp. Sta., Ithaca, N. Y., Memoir 182, Oct. 1935, H. E. White.

"Cotton Marketing Practices in North Carolina," Agr. Exp. Sta., State College Station, Raleigh, N. C., Tech. Bul. 51, Dec. 1935, Glenn R. Smith.

"A Planned Farm Program," Agr. Ext. Serv., Knoxville, Tenn., Rev. Pub. 187, Jan. 1936, J. H. McLeod and H. C. Holmes.

"Prices of Farm Products in Vermont, 1932-1934," Agr. Ext. Serv., Burlington, Vt., Ext. Cir. 84, June 1935, H. C. Norcross and A. A. Brown.

.."Financing Cooperative Marketing of Farm Products in Washington," Agr. Exp. Sta., Pullman, Wash., Bul. 322, Oct. 1935, E. F. Dummeier.

"The Agricultural Outlook for 1936," U. S. D. A., Washington, D. C., Misc. Pub. 235, Nov. 1935, Bureau of Agr. Economics.

"The Farm Real Estate Situation, 1934-35," U. S. D. A., Washington, D. C., Cir. 382, Dec. 1935, B. R. Stauber and M. M. Regan.

Record Tobacco Crop

CANADA'S tobacco crop was exceptionally good in 1935, when the production rose from thirty-nine million pounds in 1934 to fifty-four and one-half million pounds, the highest output ever recorded in the Dominion. The total acreage increased from 40,963 acres to 46,870 acres.

The greater part of the increase occurred in Ontario where there was a rise in the production of all types of tobacco. Flue-cured tobacco, the principal crop, advanced from twenty-two million pounds to thirty-five million pounds. The seasonal conditions in Ontario were very favourable and there was practically no loss from hail or frost. In Quebec there was a reduced acreage in all types of tobacco grown, particularly in the large pipe varieties, since many growers were induced to change over from

these to the production of cigar leaf on account of the higher prices paid for this type in 1934. The net result was a higher total production of cigar leaf in 1935, although from a somewhat reduced acreage. Production in British Columbia last year was practically negligible owing to the great flood at Sumas Prairie during the preceding late winter.

Jefferson Knew Value Of Farming on Contour

THOMAS JEFFERSON — third President of the United States— whose birthday is April 13, was a practical farmer. He knew conservation of soil is of vital importance to lasting and successful farming. In 1813, writing about his farm in Albemarle county, Va., he said:

"Our country is hilly and we have been in the habit of plowing in straight rows, whether up or down hill, or however they lead, and our soil was all rapidly running into the rivers. We now plow horizontally following the curvature of the hills and hollows on dead level, however crooked the lines may be. Every furrow thus acts as a reservoir to receive and retain the waters, all of which go to the benefit of the growing plant instead of running off into the streams."

Many farmers are learning today, as Jefferson learned, the value of contour plowing and planting to check serious soil losses by wind and water, reports the Soil Conservation Service.

Fruit Growing in Ontario

GENERALLY the fruit-growing areas of Ontario are in close proximity to the large bodies of water constituting the Great Lakes, and extending north to the southern part of Georgian Bay.

The northern district from Collingwood to Owen Sound is devoted mainly to apples, although small fruits are increasingly important. Apples are the main fruit crop along the east shore of Lake Huron, with some peaches in the Forest district. All along the north shore of Lake Erie fruit is extensively grown. The apple is the main crop, but in addition are other tree fruits and small fruits; in recent years peaches and grapes are being planted in considerable acreage. In the Niagara Peninsula the so-called tender fruits—peaches, pears, plums, sweet and sour cherries, grapes, small fruits—are grown in abundance, as well as a very considerable apple production. Again, fruit is a main agricultural crop all along the north shore of Lake Ontario from Hamilton to Kingston and even extending along the shores of the St. Lawrence River to Quebec Province. Certain inland counties, such as Brant, Oxford and Middlesex, also grow fruit, apples particularly, in quantities. Prince Edward county, in addition to apples, is a heavy producer of sour cherries. Strawberries and raspberries are grown practically all over Ontario.

10,000 Unpaid Volunteers Are Aid to Weather Man

A COMPLETE picture of North American climate is possible only because of the great mass of fundamental facts furnished by 5,000 volunteer weather observers. Each unofficial observer, says W. R. Gregg, Chief of the Weather Bureau, really runs a small field station, at no expense to the Government, except for the few instruments and blank forms used.

This system of augmenting official weather records began in 1891, when the newly created Weather Bureau was charged with the duty of "taking such meteorological observations as may be necessary to establish and record climatic conditions in the United States." The cost of maintaining thousands of stations to make these observations all over the country was prohibitive.

About 300 members of the present volunteer force have served for 25 years or longer. Three have been keeping records for more than 50 years and 54 for between 40 and 50 years. There are 300 women observers, three with more than 40 years of service. To prevent breaks in the continuity of the daily records, each observer has a substitute, which means that 10,000 persons are ready to give their services at any time.

Every day at a fixed time—usually around sunset—the observer records the maximum and minimum temperature, the precipitation, and such unusual conditions as wind, dust, or thunderstorms, fog, and frost. At the end of the month the record goes to the Weather Bureau in Washington, D. C., for tabulation and filing.

From millions of these records, meterologists work out the answers to countless questions on climatology. Recently these questions have dealt largely with land policies, for land is "conditioned by the sky under which it lies and by the climate which is proper to it."

Hoosier-grown Sweets Meet Market Demands

(*From page* 22)

The results of the other plots were as follows: (Approximately 14 tons manure per acre were added to all plots).

Treatment	U. S. No. 1 (bushels)	U. S. No. 2 (bushels)	Total Yield (bushels)
No fertilizer, no mulch	149	37	186
No fertilizer, mulched	178	70	248
600 lbs. 2-8-16 in the row, no mulch	236	25	261
600 lbs. 2-8-16 in the row, mulched	285	32	317
*600 lbs. 2-8-16 in the row plus 600 lbs. 0-8-30 broadcast, no mulch	176	25	201

* A very heavy set was noted on these rows. Had they been mulched or had sufficient rainfall, the results might have been by far the highest.

650 Times More Soil Loss When Rows Follow Slope

A SLOPING plot of ground near Ithaca, N. Y., planted last summer to potatoes in rows up and down hill, lost 650 times as much soil and 14 times as much water from July 7 to November 15 as two adjoining plots planted to potatoes, oats, and clover in strips across the slope. The three plots—at the Arnot erosion experiment station of the Soil Conservation Service—were each 21 feet wide and 311 feet long, with a slope of 7 per cent on the upper half and 14 per cent on the lower.

The plot planted up and down the slope lost almost 14 tons of soil per acre and nearly 14 per cent of 18 inches of rainfall. The two strip plots each lost only 43 pounds of soil per acre. The run-off was 1.1 per cent on one plot and only 0.35 per cent on the other.

The Arnot station, first in the Northeast, has completed its first year of operation.

The Inquiring Mind

(*From page* 14)

the use in this way is to be successful. The problems are: (1) The danger of delaying or even preventing germination if too much fertilizer is improperly placed near or in contact with the seed. (2) The danger of producing too much top growth in comparison with the root growth, causing what is called "firing" (a drying up of the leaves) in time of drought. (3) The danger of making a field uniform in fertility, causing the succeeding crop to be streaky and patchy. (4) The problem of knowing the best fertilizer for use in each particular case. These four problems as well as others were studied and are discussed in the report. The investigation was conducted in the laboratory, greenhouse and field, for a period of five years. A large portion of the investigation was carried on with corn because of its great importance as a crop and adaptability to special fertilization."

It is impossible in the space available to give a detailed report of the findings in this research work, but a few will undoubtedly be of interest. Field peas, cowpeas, navy beans, and soybeans were found to be very sensitive to the applications of fertilizer in contact with the seed, but that application above or below the seed largely eliminates the detrimental effect. Because of convenience and practicability, application above the seed is advisable with these four plants when fertilizers are applied in the hill or drill row. The germination of lettuce and carrots is affected and delayed most by the application of fertilizer near the surface. For these plants it is best to work the fertilizer into the soil several inches prior to planting. Squash, cucumber, watermelon, and muskmelon are quite sensitive to fertilizers, and for these it is best to apply the fertilizer about one-half inch above the seed if the fertilizer is applied in the hill.

Potato sprouts are very sensitive to fertilizer, and hence, in potato fertilization the fertilizer should be placed either to one side or else below the seed, so that the sprouts will not come in direct contact with high concentrations of fertilizer in coming up through the soil. Corn seed require considerable water to germinate, and

if fertilizer is applied in direct contact with the seed, the taking up of the water is either prevented or delayed so much by the attraction of the fertilizer salts for the water, that the corn germinates slowly or not at all. When the corn once sprouts, the sprout, unlike that of the potato, is able to pass through a considerable concentration of fertilizer, and hence, application of fertilizer above the seed for corn is a very successful method in hill and drill row applications.

The marked difference in sensitiveness of corn and potato sprouts to fertilizer raises the important question as to why this is the case. It was thought that, possibly, the sap of the corn sprouts has a higher osmotic pressure than sap of the potato sprouts, making it more difficult for the fertilizer salts to draw water out of corn sprouts, and thus cause them to lose turgidity and shrivel up. Freezing point determinations gave an osmotic pressure of 7.18 atmospheres for corn sprouts and 6.15 atmospheres for potato sprouts, indicating that the possibility just mentioned was probably true. Another factor in this connection is the amount of proection which the epidermis may give, and besides having a more protective epidermis, the corn sprouts probably have a protective sheath which the potato sprouts do not have.

Instigates Further Study

As a result of the work quoted, a great many changes were made in the recommended methods of fertilizer application, and further studies were, and are being made. In the course of an address at the first annual convention of the National Fertilizer Association, held at White Sulphur Springs, W. Va., in June 1925, Dr. J. G. Lipman, Director of the New Jersey Agricultural Experiment Station, called attention to the necessity of making a careful study of the various methods of applying fertilizer and of the machinery used for its distribution, and suggested the formation of a joint committee of agronomists, agricultural engineers, and representatives of the fertilizer and farm industries to undertake that study.

Headed Committee

In accordance with this suggestion the National Fertilizer Association, in July 1925, appointed three of its members to represent the industry on such a committee. Dr. Lipman's suggestion was conveyed to the American Society of Agronomy, the American Society of Agricultural Engineers, and the National Association of Farm Equipment Manufacturers, and each of these organizations named representatives to serve on the committee. Professor Truog was named and acted as General Chairman of the committee. In the committee report published in July 1928, special credit is given to him and to Ove F. Jensen, who acted as General Secretary, for the preparation of the report. In this report, which is very comprehensive, the great need for further investigation is shown, in order to arrive at definite regulations regarding the proper methods of application of fertilizer and the proper machinery with which to apply it. This committee still functions and is still making great progress under the direction of Chairman Salter, who now heads it.

During his period of service at the University of Wisconsin, Emil Truog has studied and taught, and he has written a large number of papers for the various scientific journals. He has been interested in the utilization of phosphates by agricultural crops, and published a bulletin on that subject in 1916. Professor Truog has also done a great deal of work in connection with the factors influencing the availability of rock phosphates, in the feeding of plants, methods of determining the fertilizer requirements of plants, tests for determining such requirements, tests for soil reactions, quick tests for phosphates and potash, and in the advancement of the use of correct, fertilizer-distributing machinery. In his report at a meeting held in Chi-

cago on Nov. 17, 1927, in speaking for his committee, he stated that at the time he felt that on the basis of present data certain definite conclusions in the methods of fertilizer application may safely be made. These are:

1. Barring serious injury to germination, the nearer fertilizer is placed to the seed the more effective is the fertilizer in promoting early growth.

2. Of the individual carriers, those carrying nitrogen are most apt to cause injury to germination; those carrying potash stand intermediately; those carrying phosphates are least apt to cause injury.

3. For practically all intertilled crops, the safest method of hill and drill row applications is to apply the fertilizer in bands along both sides of the seed and at a depth varying with the crop.

4. A placement of fertilizer, which is safe under all conditions of weather and soil, will not give maximum results in many cases.

5. Before definite and comprehensive recommendations can be made, it will be necessary to do much more experimental work.

At the present time Professor Truog confines his work mostly to research and to work with graduate students, although he does some undergraduate teaching, and conducts some classes with the Short Course in Agriculture. Wisconsin has been fortunate in turning out excellent soil scientists, and many of these are now teaching and doing research work in widely separated areas, some as far away as China and Hawaii. In his research work Emil Truog is now devoting a great deal of his time to soil colloids and will be able to report some interesting and unusual developments later.

While rather small in stature, Professor Truog is stocky, and being stocky he is naturally interested in athletics. His attendance at the football and basketball games of the University of Wisconsin has been so regular during the past 20 years, or more, that the cheerleaders know just where to find him at every game. When I asked Mrs. Truog about his hobbies, she said, "Well I guess football and baseball just about cover them all, except that he is a radio bug." So he goes about his work in a methodical way, drives a car that is not streamlined, enjoys his children, and likes his work with the graduate students. He is a member of Sigma Xi, Alpha Zeta, Phi Lambda Upsilon, Gamma Alpha, and of various scientific societies.

Esteemed by Associates

An interesting sidelight on his work came when I asked his associate, Professor Graul, to tell me something about his work and found that both of these soil scientists, working together in the same building, came from the same part of Trempealeau county in northern Wisconsin, and both grew up with the same desire to learn about the soil. Edward J. Graul says of his associate and boyhood friend, "The State of Wisconsin, the Nation, and the World have been enriched because of the work, the inspiration, the devotion, the life of Professor Emil Truog in affairs of research and in the relationships among men. A man inspired by high ideals, a man with ceaseless ambition to find the truth, a man devoted to the service of mankind, a man loved and admired by all,—this is Professor Truog."

Although Truog has done admirable work in several avenues of research, particularly in the field of soil acidity, soil phosphorus and potash, soil colloids, and related fields, and has published many papers of importance, he is perhaps even better known among graduate students as a counselor, a leader, and an executive of the highest type. His graduates are found today in all corners of the world, from the Atlantic to the Pacific, from England to Japan and Australia, in positions of the greatest responsibility and highest executive authority.

Not alone is Professor Truog a

scientist; he is also a practical farmer, putting into practice the theories that he teaches. He translates the most difficult theories into terms understood by the man at the plow. Thus farmers have confidence in his theories. When one thinks of the life and career of Professor Truog, one is reminded of the saying, "Truth is greater than fiction," and to that one can add, "Quality surmounts quantity."

Improving Pastures in New Brunswick

(*From page* 17)

It is true that the heavy growth secured in June when nitrate of soda is applied may be eaten by stock during the period when pastures are short, yet it would seem desirable to distribute the growth of grass throughout the season, so that a more nutritious and palatable grass may be provided. Perhaps a better practice for this station would be to treat the grazing paddocks referred to above with a complete fertilizer annually, reducing the amount used each year to one-half or possibly one-third the amount used the year the complete fertilizer is being applied, as at present.

Plans are now under consideration to conduct a project—using dairy cattle—to determine the best rate to apply the complete fertilizer to these pastures for maximum returns. It is proposed also to include in this project paddocks treated with superphosphate alone.

We hear a great deal today about the importance of good farm management, and it applies to pastures as much as it does to any other part of the farm. In practically all European publications on pasture improvement, a considerable amount of emphasis has been put on the importance of rotationally grazing pastures. These pastures are grazed quite heavily for a few days by cows in milk, for example, and in some cases these cows are followed by dry cows or young cattle. Each field is then rested for a period of from 10 to 20 days, depending upon the season of the year or some local condition. The number of fields may vary from three to eight. This system is no doubt the ideal way to operate a pasture, as it provides an excellent opportunity for keeping grass under control. There is also experimental evidence to show that the carrying capacity of these pastures is somewhat increased by rotational grazing, as against the continuous method of grazing.

At the Fredericton Station a project has been conducted continuously since 1929, to determine the relative merits of these two systems of grazing. During this period the continuously grazed field has an average carrying capacity of 195.84 cow days per acre, as compared with 205.57 cow days per acre on four adjoining fields that were rotationally grazed, or an increase of 4.97 per cent over the continuously grazed field. While seven years' work has shown a slightly greater carrying capacity for the rotationally grazed pasture, the advantage is not sufficient to justify the extra expense entailed in the construction of fences, not to mention the difficulties to be encountered on the average farm in supplying water and shade for stock. The writer prefers to recommend that the farmer establish a small pasture near the farm buildings, say one-half acre for each milch cow. If this pasture is fertilized and properly managed, it should provide an early pasture for milch cows some days before the main pasture is ready. During the June flush the improved pasture should be rested and all stock

put on the main pasture. When the main pasture becomes short, the improved pasture may be used at night for the milch cows. As soon as aftergrass can be provided, the improved pastures should be relieved until fall, when it should again provide good pasture for the milch cows.

While much can be done to improve pastures and increase their carrying capacity, it has not been possible to have a pasture produce uniformly throughout the summer months. Several methods of bridging the period when pastures are short have been suggested. All are helpful but none is perfect. The Fredericton Station is making a study of this problem and may have some recommendations to make in a year or two.

Fertilizer should be applied as soon as possible after the first signs of growth in the spring; care should be taken, however, to avoid cutting the sod with horses' feet or machinery. This station has applied minerals in the fall and spring. Fall applications may be preferable if the field is level; however, it is doubtful if farmers will go to the expense of making two applications in one year, especially when the advantage is not particularly marked. It is a good practice to harrow pastures in the fall to spread the droppings and loosen the sod; this should be done when the field is comparatively dry. Pastures should not be under or overgrazed; if they are over-grazed in the fall, they will be slow in making growth the following spring; if they are under-grazed in the spring, a poor quality of grass will be produced, and the bottom grasses and clovers will not develop properly. The aim should be to keep the grass in pastures from three to five inches high at all times; grasses must not be allowed to head out. If the grass gets out of control, it may be advisable to cut it with a mower—the cut grass will be readily eaten by stock.

The writer has attempted to touch upon a few rather important factors relating to pasture improvement. Some of the findings made at Fredericton are out of line with those secured elsewhere. This is not surprising, as soil and climatic conditions, even within the Maritime Provinces, differ considerably. However, the statements made in this article are based on several years of careful work and should apply to many sections of this country.

Left: Largely weeds and moss. Right: Brown top, Kentucky bluegrass, and wild white clover.

Side-dress Corn With Potash

(*From page* 8)

Table I gives the results of the side-dressing experiments in Iowa. The dates of application are shown in each case. Some were made as late as the middle of July. Certain of the fields received more rainfall than others. Then, too, others were frozen earlier in the fall, and for these reasons we are making no attempt to interpret the data statistically, or otherwise. Each experiment is of value so far as the conditions in that particular field are concerned. The trend, however, in all of these tests showed that the corn plants were very decidedly benefited by these extra potash applications. In most cases the benefits were obtained not only in increased yields but in the amounts of marketable corn produced. Figs. 2, 5, 7, and 8 show the results of the tests on the farms of several of the cooperators.

At harvest time the corn was sorted, usually by the cooperating farmer, into marketable and poor quality ears. The effect of the potash on quality was quite marked in nearly every field. Most farmers estimated that the corn classified as of poor quality was worth less than half price, so far as feeding value was concerned. Corn was selling at about 50 cents per bushel at that time.

A 100-lb. application of muriate of potash would have cost about $2.33 in Iowa and $2.28 in Illinois, at 1935 prices. Thus, an increase of about 4¾ bushels of corn at 50 cents a bushel would be sufficient to pay for the cost of potash; or an improvement in quality of 9½ bushels of corn per acre, that is, changing the quality from poor to marketable, would pay for the potash regardless of yield. High yields and good quality usually go together.

The "feed value per acre of corn," which depends on both yield and feeding quality, is more important than most corn growers realize. For instance, about 84 per cent of all Iowa corn is marketed as meat, and not as corn. The farmers who feed their own corn should be more certain that

Fig. 7—Henry Bruhn field, August 30, 1935. Left: Without potash, lower leaves of plants showed severe brown marginal firing. Right: Response to 100 lbs. of muriate of potash seven weeks after side-dressing.

they are getting maximum yields of feed from each acre. They should ask themselves the question, "How many potential pounds of beef or pork am I growing on each acre?"

The proportion of higher quality corn on the potash-treated plots would have been higher in several of the tests had the season been longer and the corn matured better. With the early

TABLE I—RESULTS OF SIDE-DRESSING TESTS IN IOWA, 1935

Cooperator, location, treatment, and date of side-dressing with muriate of potash	Yield Records			Increases due to side-dressing	
	Bushels corn per acre	Per cent marketable	Bushels marketable	Total bushels corn	Bushels marketable
H. Lindhorst, Algona:					
No potash	26.4	13.9	3.7	...	...
100 lbs. potash July 12	54.1	42.9	23.2	27.7	19.5
200 " " " "	53.2	43.6	23.2	26.8	19.5
Henry Bruhn, Cylinder:					
No potash	27.5	30.5	8.4	...	...
100 lbs. potash July 12	41.9	55.4	23.2	14.4	14.8
200 " " " "	42.9	66.8	28.7	15.4	20.3
Henry Cahill, Mason City:					
No potash	47.6	37.5	17.9	...	...
100 lbs. potash July 16	57.0	49.2	28.1	9.4	10.2
200 " " " "	73.2	68.2	49.9	25.6	32.0
W. G. Meyer, Webster City:					
No potash	13.3	18.8	2.5	...	...
100 lbs. potash July 15	29.2	41.5	12.1	15.9	9.6
200 " " " "	30.7	41.5	12.7	17.4	10.2
R. J. Abels, Ellsworth:					
No potash	28.3	40.0	11.3	...	...
100 lbs. potash July 9	48.1	40.0	19.3	19.8	8.0
200 " " " "	50.8	44.7	22.7	22.5	11.4
Isaac Gressley, Williams:					
No potash	17.9	9.2	1.7	...	...
100 lbs. potash July 9	33.8	50.8	17.2	15.9	15.5
200 " " " "	36.6	55.4	20.3	18.7	18.6
B. T. Calkins, Webster City:					
No potash	32.9	57.3	18.9	...	...
100 lbs. potash July 9	41.7	60.9	25.4	8.8	6.5
180 " " " "	41.6	52.6	21.9	9.7	6.0
No potash	31.9	49.9	15.9	...	...
Ray Baird, Webster City:					
No potash (lowland)	65.7	75.3	49.5	...	...
200 lbs. potash July 15	80.5	72.3	58.2	14.8	8.7
No potash (upland)	70.8	78.8	55.7	...	...
200 lbs. potash July 15	82.9	87.9	73.8	12.1	18.1
C. J. Skow, Wesley:					
No potash	39.1	33.2	13.0	...	...
100 lbs. potash July 13	45.4	34.4	15.6	6.3	2.6
200 " " " "	47.8	50.0	23.9	8.7	3.8
No potash	39.1	51.4	20.1	...	...
Schuler Bros., Wesley:					
No potash	25.7	43.6	11.2	...	...
200 lbs. potash July 13	44.5	56.8	25.3	18.8	14.1
August Vaudt, Whittemore:					
No potash	48.9	60.8	29.7	...	...
200 lbs. potash July 12	63.2	73.8	46.7	14.3	17.0
George Fandel, Rodman:					
No potash	29.4	48.8	14.3	...	...
200 lbs. potash July 12	35.0	50.5	17.7	5.6	3.4
H. S. Kooker, Cylinder:					
No potash	22.2	25.3	5.6	...	...
200 lbs. potash July 10	35.6	35.3	12.6	13.4	7.0
C. R. Booth, Mason City:					
No potash	18.1	9.6	1.7	...	...
200 lbs. potash July 16	38.2	9.4	3.6	20.1	1.9
Dell Stafford, Blairsburg:					
No potash	35.7	61.4	21.9	...	...
150 lbs. potash July 15	48.2	65.4	32.2	12.5	10.8

Fig. 8—Henry Bruhn field, corn from 100 hills, October 18, 1935. Marketable corn in sacks; poor quality on ground. (See Table I.)

frosts and the relatively late application of potash in some cases, a larger proportion of immature corn was produced than would be obtained in an average season. Nevertheless, the results on the whole show that higher yields of better feeding quality corn can be produced profitably, when the plants showing hunger signs for potash are supplied during the earlier part of the growing season.

The soils in southern Illinois, where a distinct need for more potash is developing, are entirely different from those in northern Iowa. These Illinois soils are very acid, level and drained with difficulty. They are called "old" soils by the soil survey folks. The subsoils are heavy and rather impervious to drainage and root growth. They need lime and phosphates also. When, however, lime and phosphates are supplied, the need for potash soon becomes a limiting factor for production.

Of interest regarding these soils, is a recent report from the University of Illinois. The following figures on yields of corn are from the fertility plots at their Toledo farm.

Treatment	Av. Yield 1914-1931	Yield 1932
R	18.5	31.1
RL	26.0	28.9
RLrP	26.5	31.5
RLrPK	40.6	61.8

R—residues; L—limestone; rP—rock phosphate; K—potash.

These data show that potassium is the important material needed in this soil to increase the yields of corn.

Originally, the plans for demonstrations in Clark county, Illinois, were made to assist Farm Adviser R. E. Apple in conducting fertilizer demonstrations using potash on the corn just after it was planted in fields where lime and phosphate had been used for some time, and particularly where sweet clover had been plowed under as a green manure crop. Due to excessive spring rains the corn was planted late, and as a result the potash applications were not made until July 5. In fact, the Shawver test had the potash applied on July 25.

On July 5, however, corn in several

TABLE II—RESULTS OF SIDE-DRESSING TESTS IN ILLINOIS, 1935

Cooperator, location, treatment, and date of side-dressing with muriate of potash	Yield Records			Increases due to side-dressing	
	Bushels corn per acre	Per cent marketable	Bushels marketable	Total bushels corn	Bushels marketable
Osby Claypool, Marshall:					
No potash	18.9	55.8	10.5	...	...
50 lbs. potash July 5	27.7	66.1	18.3	8.8	7.8
200 " " " "	28.3	64.7	18.3	11.7	10.0
Without potash	16.6	52.7	8.3	...	...
John Ross, Martinsville:					
No potash	16.3	64.0	10.5	...	...
200 lbs. potash July 5	21.6	75.0	16.2	5.3	5.7
E. A. Shawver, Casey:					
No potash	21.6	48.8	10.6	...	...
200 lbs. potash July 25	30.6	65.6	20.1	9.0	9.5

fields had already begun to show the characteristic marginal firing of the lowermost leaves. This indicated "potash hunger," and therefore these tests also showed what can be done with potash supplied after the symptoms of injury appear early in the season.

In Table II the results of these three tests are given.

In studying the results of these tests, it cannot be recommended that side-dressings should replace hill or row applications of potash fertilizers. Sufficient potash supplied at planting time will no doubt produce the maximum growth response, because the damaging effects of stunted growth and injured leaves would not occur early in the season. Side-dressings with potash, on the other hand, may enable a corn grower to save his crop on areas in his fields where these early symptoms of potash starvation injury occur.

For the alkaline or "high-lime" soils in Iowa and these acid soils in southern Illinois, side-dressings are a means of supplementing the regular fertilizer treatment with extra potash when needed. The most important point is that it is not too late to supply potash after the symptoms of potash starvation damage appear on the leaves of young corn plants early in the growing season. This extra potash may determine whether a profitable crop is produced.

Fertilizing Georgia's Cotton Crop

(*From page* 11)

to use on cotton. The results obtained from the plots fertilized in this way are given on the last line of Table 1. The profit per acre was $17.96, and the profit per dollar invested was $2.75. This was the best combination of these two figures obtained from any treatment and for all practical purposes the "high" for both of them.

In order to test out the above recommendation, the Georgia Experiment Station located a number of demonstrations on widely scattered farms in 1934 and 1935. One acre was left as the farmer fertilized it and another acre was top-dressed so as to bring the application up as close as possible to the Station's recommendation. The results are given in Table 3. The extra nitrogen and potash used cost $2.24, gave an increase of 192 pounds of seed cotton per acre, and paid a profit of $6.26 per acre.

TABLE III—Balanced Fertilizer Demonstrations, 1934-35.*

Regions in Georgia	No. of locations	N-P_2O_5-K_2O Ck. acres farmer's treatment	N-P_2O_5-K_2O Total lbs. plant food on treated acres	Seed Cotton per A. Check acres	Seed Cotton per A. Treated acres	Seed Cotton per A. Inc. from treatment	Profit per A. from treatment	Return per dollar invested on additional plant food
Northern . .	27	12-28-12	29-28-29	827	1,006	+179	$5.82	$2.60
Coastal Plain	22	13-24-14	31-24-31	889	1,093	+204	6.78	2.83
Av. for state	49	13-26-13	30-26-30	858	1,050	+192	6.26	2.63

* Nitrogen, 10c per lb.; potash, 3.2c per lb.; seed cotton, 4½c per lb.

There are any number of ways in which the above fertilizer may be applied. Four hundred pounds of a 4-8-8 can be top-dressed with 100 pounds of nitrate of soda, a 4-8-4 can be top-dressed with 100 pounds of soda and 32 pounds of muriate of potash, or a 3-9-3 can be top-dressed with 125 pounds of nitrate of soda and 40 pounds of muriate of potash.

The above recommendation will apply only to average conditions and should be modified for special soils and for special conditions. More phosphates can often be used to advantage on soils well supplied with moisture, or on new ground, and on soils which have not been fertilized for a number of years. Less nitrogen and less potash will be needed where barnyard manure is used. Where green manure crops are used, less nitrogen is needed. The use of lime or limestone will increase the need of potash. On some of the grey, pebbly soils and heavy, red soils of the Coastal Plain and some of the sandy soils of the Piedmont, more potash will often pay.

Soaked Again

(*From page* 5)

vide, we next consider the in-between fellows who use methods intended to reduce the loss of water already generously supplied.

Weed destruction, litter mulches, and surface cultivation are among these methods. If a soil's vegetation is thin or quite depleted, the reserve water which gravity pulls to lower levels is not rapidly lost; and an area covered with rank vegetation, such as weeds, increases the drawing off of such water from the land. As weed removal is certainly a more direct means of halting water loss than tillage mulching, then there is every reason why in time the Government will find grants for weed eradication of real community benefit.

If we can afford to pay for legume sodding to hold water or legume turning to build organic matter, surely the weed in its fearful flights abroad affords ample reason for a bonus to retard it. I know it's going to be irksome to aid the kind of farmers who prefer weeds, but if we're in for real reform, let's make it practical. Education doesn't seem to have done the trick—maybe we can pay them to be good, while the money lasts! The only drawback in sight is whether Congress will be able to find enough taxes to cover the cost of a finish fight on quack grass! Maybe if we taxed public nuisances for that purpose it would be elemental justice without political repercussions. Send in your ideas and become famous. It will be your sole reward, because we have no cash contest going.

"Light showers of frequent occurrence are thought to form a surface crust that affords capillary connection with lower soil levels and thus causes constant water loss."

When I first heard this statement about 30 years ago, it fell on deaf ears and stubborn mind. I owned no land, had no objective in life except to go swimming and rabbit hunting, hence I imagined such doctrine was only used to force my unwilling hands to grasp the cultivator handles and my sunburnt neck to feel the chafe of the reins. My only relief when assuming these irksome tasks was to jump into the shady spots under the alders at the end of the row, just to feel the sweeping thrll of a cool foot-kiss, after striding ankle deep in scalding sand for 40 rods. And often I would duck into the thicket for plums, while the mare swished flies and chewed corn

tops. But sometimes since when I recall that father, meanwhile, was pitching beyond his aged strength in the meadow for a few skimpy loads of timothy, my self-pity turns to blasts of belated anger for that witless wight that once was I.

Extremes in the land's water-holding capacity often show up in the same township. In one place in my state thick clay soil holds 40 per cent of its water supply in April against Newton's law, and the spring work thus gets a set-back. A few miles away beds of loose sand act like a sieve, and the farmers spread out tons of calcareous clay to stop up the porous leakage. The just and the unjust both get the rainfall, but there is no justice in what happens afterward.

And finally, we reach the third class of tormented tillers, those who have excess water troubles or who possess water in the wrong places. If their heavenly petitions are pitted against those who bemoan lack of water, it isn't any wonder that the only answer seems to be that the Lord helps those who help themselves.

IT CAN'T shine and shower at the the same time and then leave results which amount to anything either way. And if one season is dry everywhere and the next one correspondingly damp, neither season will satisfy all of us. Nature won't cater and compromise, so her partners must.

Take those old familiar gullies in the fields 40 years ago. They didn't alarm us much because it was taken as testimony that we had heaps of rainfall in our favored section. "Better'n alkali flats anyhow," said our old uncle who squatted for a season in the Panhandle, only to return with more remorse than results.

We kids used the gullies for miniature ski-jumps or bob-sled thank-you-ma'ams in winter. In summer they were handy places to cast away the outworn and outmoded riff-raff of the machine shed, including tin cans, wash boilers, and other rusty relics of a ruthless race. Yet gradually, those gaps became cavernous and finger-like, until, like some giant claw of evil omen, they clutched the heart and sinew of the soil in their grasp, and in some cases drove the owners of the farms to utter abandonment.

NOW in the dawn of a determined era cometh the erosion engineer and the terrace tinker to see that we farm our hillsides more wisely and keep our top-soil from emigrating to grow rice in Louisiana. This is another drive that has my powerful endorsement. Yea, forsooth, soil-saving dams are "damn-saving" for soils and for those who have to work them.

I have yet to hear anybody connected with the new soil conservation law mention anything about grants for drainage. Far be it from me to suggest any further ways to deplete the 500,000,000, less uphead and overkeep. It came pretty hard and filled enough pages of the w. k. Record anyhow, so I am not inclined to ask for more new ways to help it trickle out of Washington.

Were there ample funds—which there never are—I would at least whisper a word about drainage, that is, of a special and particular kind. I know plenty of farmers who cannot grow alfalfa because agronomists say it won't stand wet feet. There are areas of low-lying flat and crusty spots on many farms which cause almost as much trouble as rocks and stumps when it comes to doing a genuine wholesale job of tillage and crop raising. I am not for going into this in a reckless way, and after I had secured a few hunks of persuader for the project, I would bar certain highly ambitious gentlemen who want tile laid and ditches dug under and around every acre in America. From my own limited local observation of what drainage districts turned out to be in

parts of certain northern states, some of those hawk-eyed predatory promoters would find excuse to drain the bad lands of Dakota if any Federal funds were afloat.

IF YOU really want to see the product of some of these fancy, gilt-bond investments, ask one of the field men for the Resettlement Administration to pilot you. Trying to farm on peat petered out after fortunes were sunk in the venture, and mostly because they failed to provide a way to keep the frost from killing truck crops in midsummer, and trying to grow potatoes on prehistoric lake beds, are my idea of stultified science and persecution of coots and herons.

But as we stand on the threshold of another growing period with its simple wonders and commonplace mysteries, the signs augur well for a season of plenty and a harvest of great joy. Snows have covered many farms in the North and protected the new seedlings from winter harm. The tilth and texture of the land will respond to the penetration and chemical virtues of snow water, and root establishment should be easy and deep in the next two months. If, as some weather-wise old-timers aver, the hard winter of sleet and gale is apt to usher in a genuine, well-balanced summer of thunder storms and great corn-growing interludes, we shall see what we shall see along about September.

If there is anything more snug and enjoyable for a born-and-bred farmer than to listen to a steady, gentle rain falling on the roof and to see it seeping into the land and renewing the hopes of the harvest, find it for me. In the towns they do not accept it so kindly, unless perchance they are small towns, or big towns with a few land-dreaming people peering at the storm from an office window. The folks in the small places still rely on the good gifts of nature for their sustenance and success, being themselves akin to the farmer. The wayward exile from the soil who lingers in some metropolitan scene does not growl quite as much if he loses his umbrella or forgets his galoshes as the city-bred chap who thinks Henry Ford makes soybeans or something, and who doesn't realize that milk is over 80 per cent water.

So whether we have had to bolster up our farms with balanced plant food or not, the coming of the rain is welcome indeed, for in any case it furnishes the final touch to a certain return for family labor and much planning.

I shall never forget a rousing farm assemblage in a big auditorium in Washington one day in March 1935. You could tell without a doubt that the 5,000 men in that great hall were farmers. From a rear seat high in the gallery I could detect it, and how? By the color of their necks! No, not from lack of water, but from a healthy combination of sunshine and rain, and constant outdoor communion with the surging life in abundance, from which America gets its power and purpose.

FARMERS are partners with the rain and the dew and the dust. They mingle with it and make use of it long ere the parson thumbs the final handful which he tosses on their tombs. Here's to 1936, and many succeeding seasons! Let your job be to conserve what water we get and lay up enough crops from each season of plenty to keep the drought demons from scaring and scorching us as they did two years ago.

Beyond that we are arrant gamblers no doubt, but after all the game is a heady one and a healthy one. It is indeed proof of the relation of our life and our language when "rain" rhymes with "grain" and "shower" with "power." My best wish for 1936 is that your rain barrel be full and your land fertile. And on your part congratulate me that I have not resorted to the flippant synonym, "H_2O."

From Year to Year

CROPS as well as fertilizers require plant foods.

1. The fertilizer manufacturer contracts for his plant foods for the ensuing season.

2. As they are received they are stored in his warehouse pending mixing and curing operations.

3. The manufacturer draws against these stocks of plant foods to main tain an even flow of goods in process of manufacture through his factory.

4. Warehouse stocks of plant foods have been converted into commercial fertilizers—ready for application to the soil.

1. The farmer estimates his fertilizer needs and buys his plant foods.

2. The farmer stores his fertilizer in his barn pending its use on his fields —his soil factory.

3. The farmer prepares, fertilizes and plants his fields. Plant foods now become goods in process of manufacturing—CROPS.

4. Growing crops have extracted their nourishment from plant foods added to the soil. They are harvested and sold off the land.

UNLESS the supply of plant foods is constantly replenished, here is what happens...

5. The manufacturer runs his factory until goods in storage have all been converted to finished products.

5. The farmer keeps raising crops until the reserve of plant foods in his acres is exhausted.

THEN BOTH SHUT DOWN

American Potash & Chemical Corporation

70 Pine Street New York

Sales Offices

Atlanta, Ga. Baltimore, Md. Columbus, Ohio

PIONEER PRODUCERS OF MURIATE IN AMERICA

FREE LOVE

Judge: "What do you wish to charge against your husband?"

Wife: "Free love, your honor, he ain't supported me for eight years."

"Do you believe in clubs for women?" asked the reporter of the local newspaper, interviewing the visiting celebrity.

"Yes," he replied judiciously, "if kindness fails."

An old German and his wife were given to quarreling. One day, after a particularly unpleasant scene, the old woman remarked with a sigh:

"Vel, I vish I vas in heaven!"

"I vish I vas in the beer garten," groaned her husband.

"Ach, ja!" cried the old wife. "Always you pick out the best for yourself!"

He (at the phone): "I want to insert a notice of the birth of my twins."

Girl (at the newspaper office): "Will you repeat that, sir?"

He: "Not if I can help it."

AT IT AGAIN

An American, "doing Scotland," expressed his great admiration for Loch Katrine. "I guess we could do with that strip of water in Noo York," he said. "There should be nae trouble in gettin' it over there," replied the Scot to whom he addressed the remark. "Wall, stranger, an' how could you do that?" questioned the Yank. "Easy enough," replied the Scottie, "a' ye need is a few miles o' pipes, an' if ye can sook as well as ye can blow, it wad be ower the Atlantic in nae time!"

NO DIPLOMAT

History Prof.: "Who was Talleyrand?"

Student: "A fan dancer, and cut the baby talk."

A party of tourists were being shown over the cathedral by a guide.

"Behind the altar," he told them, "lies Richard the Second. In the churchyard outside lies Mary Queen of Scots, also Henry the Eighth. And who," he demanded, halting above an unmarked flagstone, "who do you think is a-lying 'ere?"

"Well," answered a nearby tourist, "I don't know for sure, but I have my suspicions."

Nurse: "Junior, I have a surprise for you."

Junior: "I know all about it. I even know their names."

Nurse: "Why, Junior!"

Junior: "Yes, I do. When the doctor told Daddy, he said, 'Twins! Hell and Blazes!' "

Teacher: "What is a censor?"

Oswald: "A censor is a man that goes from house to house to increase the population."

"Drink," said the Irish lecturer, "is the greatest curse of the country. It makes yer quarrel with yer neighbors. It makes yer shoot at yer landlord, and it makes yer miss him."

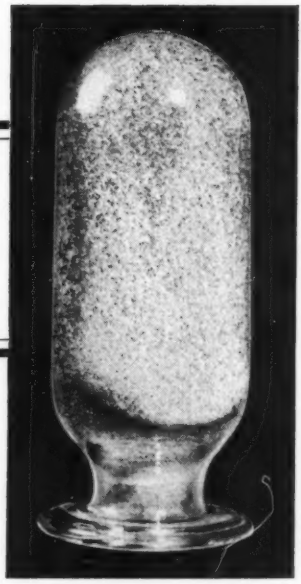
SIGNIFICANT?

THE German farmer--who, because of the unlimited supply practically at his doorstep, has been able to use potash unsparingly--produces an average of 36 bushels of wheat to the acre; the best average yield the American farmer gets from his land is 11.1 bushels. The comparison is the same with oats (Germany 60.9 bushels per acre; United States 19.8)--and with potatoes (Germany 224.6 bushels per acre; United States 99.6)--and with all other crops for which 1933-4 statistics are available. Can anyone doubt that these much heavier German yields are due at least in part, to the German farmer's more generous use of potash?

POTASH COMPANY OF AMERICA

Mercantile Trust Building

Baltimore ⁂ Maryland



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Both 50% and 60% Grades

MANURE SALTS

Aerial view of hoist and grinding plant at the U. S. Potash Company's mine near Carlsbad, N. M.

BETTER CROPS WITH POTASH

Every pound of Potash that goes into the soil to enrich our agricultural products helps to raise our standards of health for it is a simple truth that there is a definite relation between health and soil fertilization. Lands adequately fertilized with the proper fertilizer produce foods which build and maintain healthy bodies. Cotton, tobacco, corn, wheat and potato crops are benefited by Potash. Fruits and vegetables are richer in food value and tend to keep better because of this important plant food.

MURIATE OF POTASH

50% and 62½% K_2O

MANURE SALTS

Approximately 30% K_2O

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